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14. Software Catalog	Alto Subsystems Catalog
15. Field Guide	A Field Guide to Alto-Land
16. User's Primer	The Alto User's Primer
17. Creating a Disc	How to Create a Disc Pack
18. Executive User's Guide	Executive User's Guide Information
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24. Copydisk	Copydisk Information
25. FTP	File Transfer Program Information
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28. Bravo	Bravo Information
29. Scavenger	Scavenger Information
30. Empress	Empress Information
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32. Pressedit	Pressedit Information
33. Hardware Manual	Alto Hardware Manual
34. Software Manual	Alto Subsystems Manual

INTRODUCTION

THE ALTO

The alto is used to prepare and print documents containing text, diagrams, and images, to convey messages electronically, to aid in circuit and IC design, and to write programs. It is a minicomputer consisting of a processor, disk drive, workstation, and Ethernet transceiver. Optionally, it may be ordered with a Diablo Hytype printer and/or a second disk drive. The Alto can also be used to drive other devices ranging from communications interfaces to production machines.

There isn't much special-purpose hardware in the Alto. Most of what you read about in the hardware manual is in fact implemented by microcode. This gives us considerable flexibility in the way we design software interfaces for experimental devices and specialized instructions.

A standatd Alto system includes:

An 875-line television monitor, oriented with the long tube dimension vertical. This monitor provides a 606 by 808 point display which is refreshed from main menory at 60 fields (30 frames) per second. One bit in memory shows up as one bit on the screen. Since the screen is 606 by 808 points, a quick calculation shows that a full-screen display requires nearly 32K of the Alto memory. For a machine with only 64K of memory minimum, that seens a big price to pay. The theory is that in exchange for the space we get enormous freedom to experiment with various strange ways of manipulating the screen. It has programmable polarity, and a cursor, whose position is controlled by the mouse, and is a 16 by 16 bit-map whose shape is under program control, independent of display content.

- An encoded keyboard.
- A mouse (pointing device).
- A Diablo Model 31 disk drive. The Model 31 accepts a single disk which can be used to store about 2.5 megabytes. The average seek time is 70 ms, the average transfer rate, 1.22 MHZ. A second drive can be added.
- An interface to the Ethernet, a 3mbps serial communication line. An Ethernet transceiver connects the Alto to the Ethernet. Using the Ethernet, an Alto can communicate with a large number of other Altos, computers special purpose servers.
- The microcoded processor has 64K of 850ns, 16-bit word semiconductor menory (expandable up to 256K in 64K banks). A 3K microinstruction Ram which can be loaded with special purpose microcode to extend the instruction set, perform special functions or drive special I/O devices.
- The processor, disk, and their power supplies are packaged in an under-table-size cabinet for easy placement in the user's office. The other I/O devices may be a few feet away, and are packaged for desk top use.

THE NETWORK

The network is composed of Altos and other computers connected to several geographically disperesed, technologically innovative local computing nets which, in turn, are tied together by minicomputers over standard leased and/or dial-up telephone lines. The local computing nets are called Ethernets; the min-computers linking them are referred to as Gateways, the latter providing several services in addition to linking together Ethernets.

Question: Why have a network? Answer: Because it's nice to be able to pawn off some of the work on other machines, leaving your Alto free. That's why we have a number of machines generically called servers. Normally, server Altos have special purpose, expensive hardware attached to them (e.g. large-capacity disks, printers), and their sole purpose in life is to make that hardware available to more than one person/Alto. We tend to identify servers by function, so we talk about printing servers, file srvers, name lookup servers, mailbox servers, and so on. many of the protocls for use on the Ethernet were developed precisely so that personal Altos could communicate effectively with server Altos.

We all know how uncommunicative computers can be, and Altos are no different. That's why we invent careful protocols for them to use in talking to each other. Most of the protocols now in use on the Ethernet are called Pup-based (Parc Universal Packets). You will probably hear some of the following protocol names being tossed about in conversation:

(0) EEFTP- a grand-daddy of file transfer protocols (Experimental Ether FTP). No longer in active use.

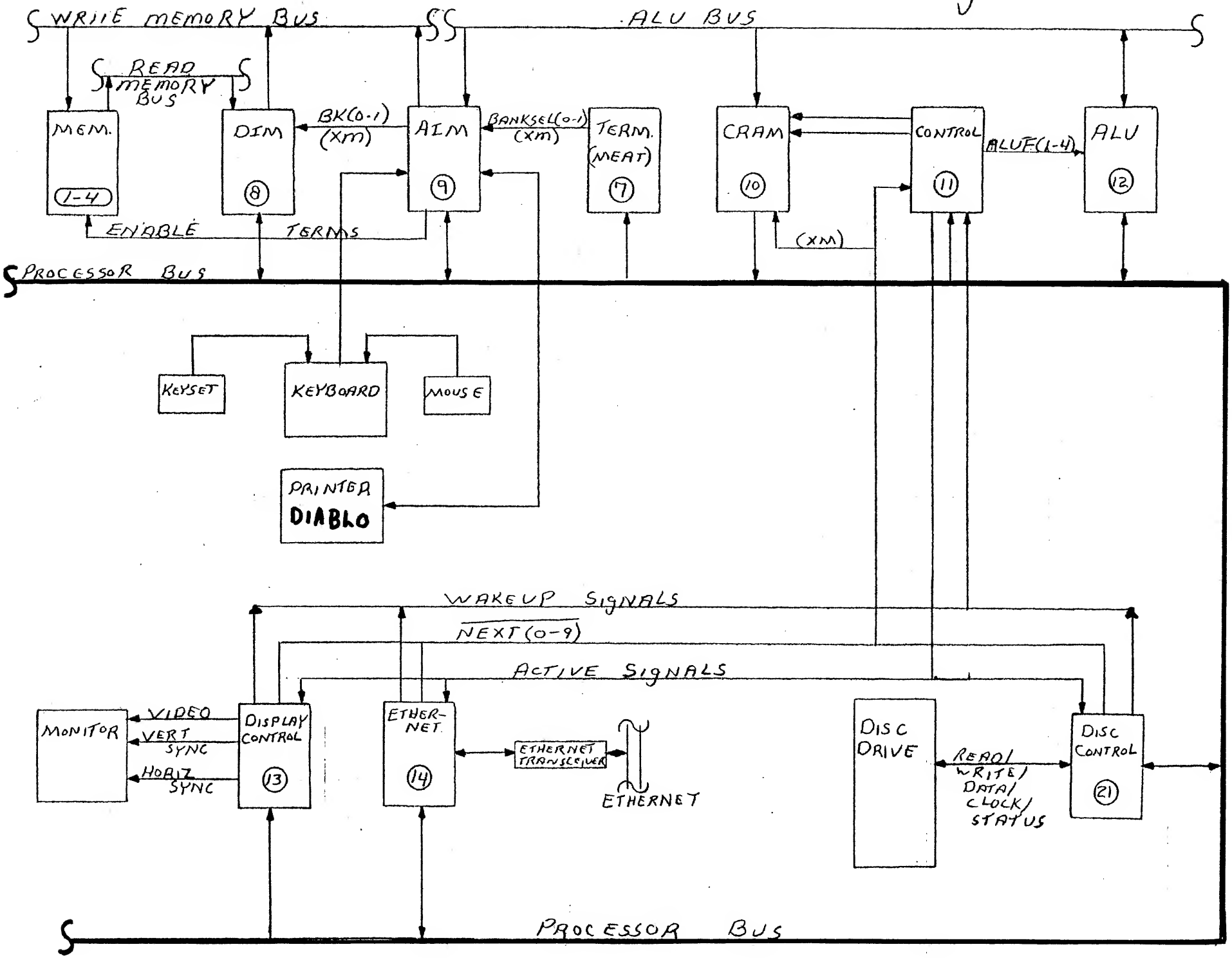
(1) EFTP- stands variously for Early FTP, Ears FTP, Experimental FTP. A venerable protocol now mostly used to transfer files to printing servers. The Alto program Empress uses it for this purpose.

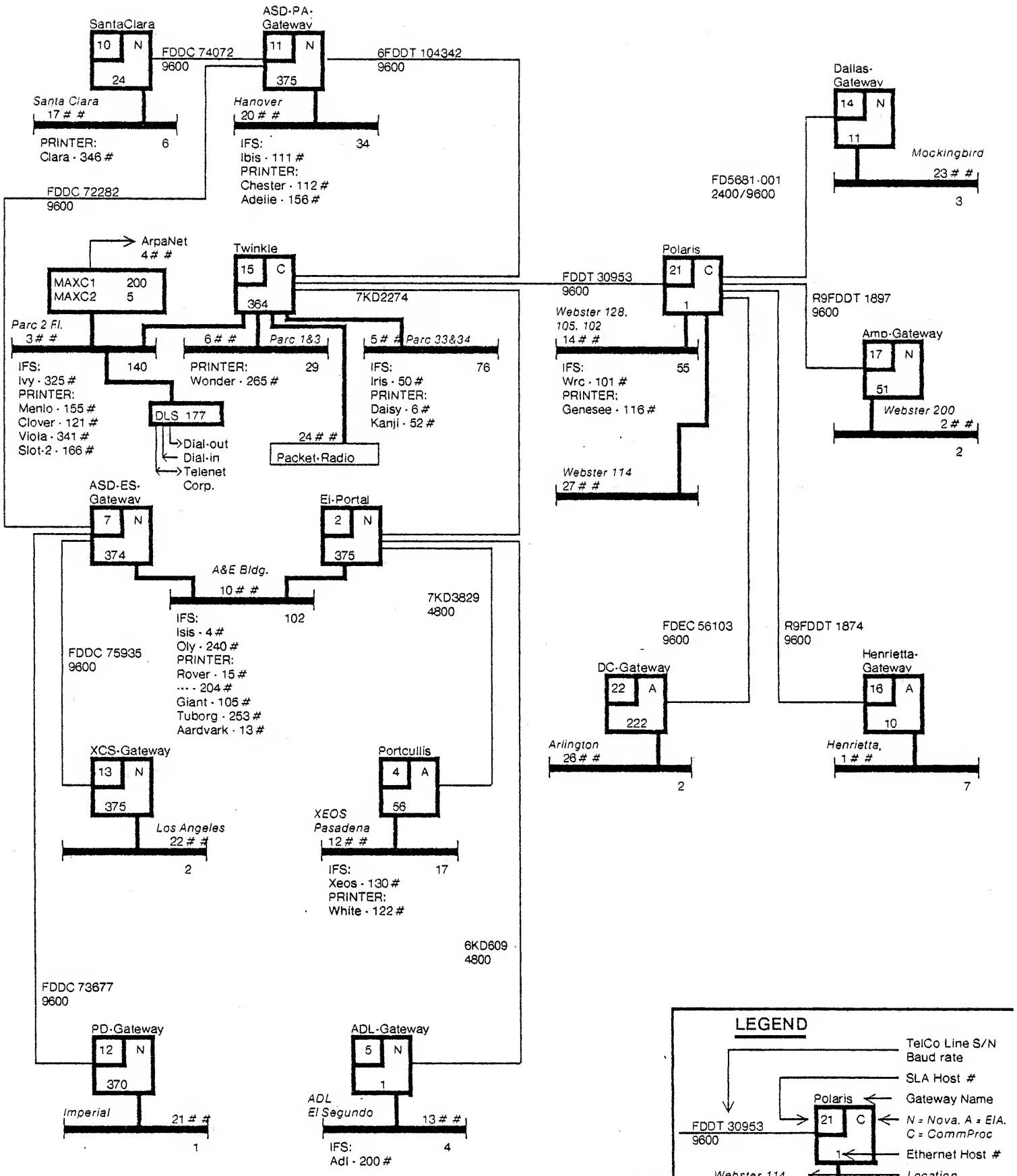
(2) FTP- refers to File Transfer Protocol, as well as the Alto that implements it and provides an interactive user interface. If you come from the Arpanet world, Don't confuse this FTP with the one out there - ours is Pup-based and incompatible. On MAXC, where both the Pup and Arpa FTP protocols come in handy, the name FTP refers to the Arpa one and PupFTP (obviously) refers to the Ethernet one.

(3) BSP- the Byte Steram Protocol. Built on top of Pup, this protocol is used by conversants who want to view the network as a full-duplex stream of 8-bit bytes. BSP is used to implement FTP.

(4) MTP- the Mail Transfer Protocol. Used by Laurel (the Alto-based message system) to ship messages to and from mailbox servers.

ALTO II MODULE BLOCK DIAGRAM





ALTO NATIONAL NETWORK NETWORK TOPOLOGY

February, 1979

Message <axelrod> for changes

Filed on:[maxc]<altodocs>AltoNetwork.press

BOOTING INFORMATION

The process of "booting" the Alto is one of setting some or all of the Alto's state either by reading a file from the disk or by accepting packets from the Ethernet.

There are four basic steps in "booting" the Alto: (1) the tasks in the microprocessor are reset; (2) a 256-word "boot loader" is loaded into main memory and started; (3) the boot loader loads a portion of Alto main memory from a "boot file" and finishes by transferring to a known place; (4) the user's program loaded by the third step can restore even more of the Alto's state.

Booting

"Booting" is accomplished either by pushing the "boot button" located on the rear of the keyboard or by the Reset Mode Register, the emulator task is started in a standard boot program. This program reads location #177034, a word whose contents can be altered by pushing various keys on the keyboard. If the <bs> key is depressed during booting, the machine state will be restored from the Ethernet; otherwise, the state is restored from the disk.

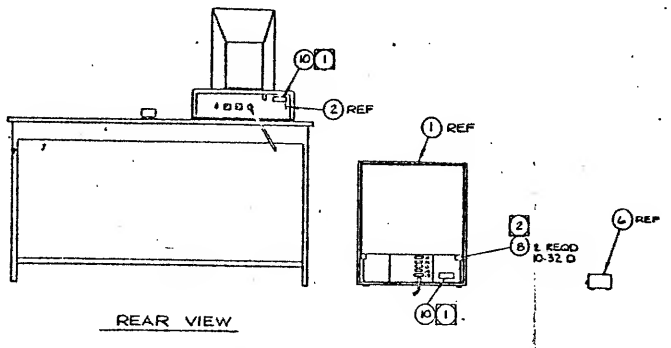
When booting from the disk, the keyboard word is interpreted as a disk address where a "disk boot loader" is located. If no keys are depressed, disk address 0 is generated, which is normal resting place of the "disk boot loader" for the operatinng system. The emulator reads a single 256-word disk record into memory locations 1, 2, ...#400: the 8-word disk label for this page is placed in #402, #403, ...#411. When the disk transfer is complete, control is transferred to location 1 in the loader. The boot loader uses the saved label to point to the remainder of a "boot file" which is read into main memory and started.

When booting from the Ethernet, the microcode waits until a "breath of life" packet arrives, containing a 256-word "ethernet boot loader" which is read into locations 1-#400 and executed by transferring to location 3. It is up to this loader to establish communications with a party willing to deliver the remainder of the state needed.

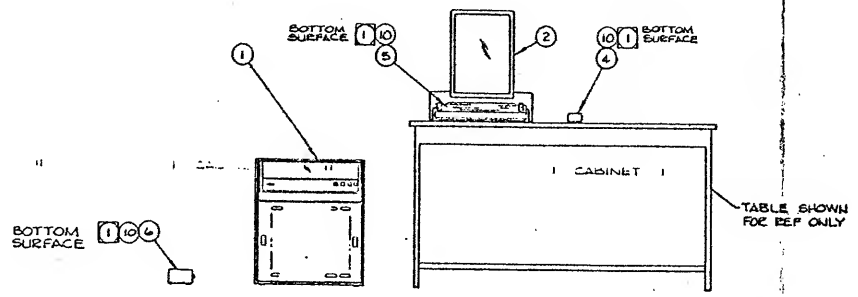
REVISIONS					217179 A
LTR	SYM	DESCRIPTION	ECO	DATE	APPROVED
	A	ENGNG RELEASE			

NOTES: UNLESS OTHERWISE SPECIFIED

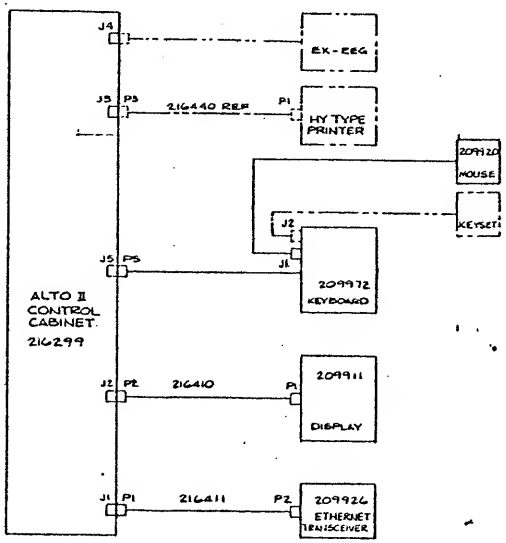
1. ADHERE NAMEPLATE (ITEM 10) ON SURFACE SPECIFIED. TYPEWRITE ASSY NUMBER AND SERIAL NUMBER.
2. ITEM 8 INSTALLED FOR SHIPPING PURPOSE ONLY.



REAR VIEW



FRONT VIEW



SYSTEM CABLING DIAGRAM

ENGINEERING RELEASE

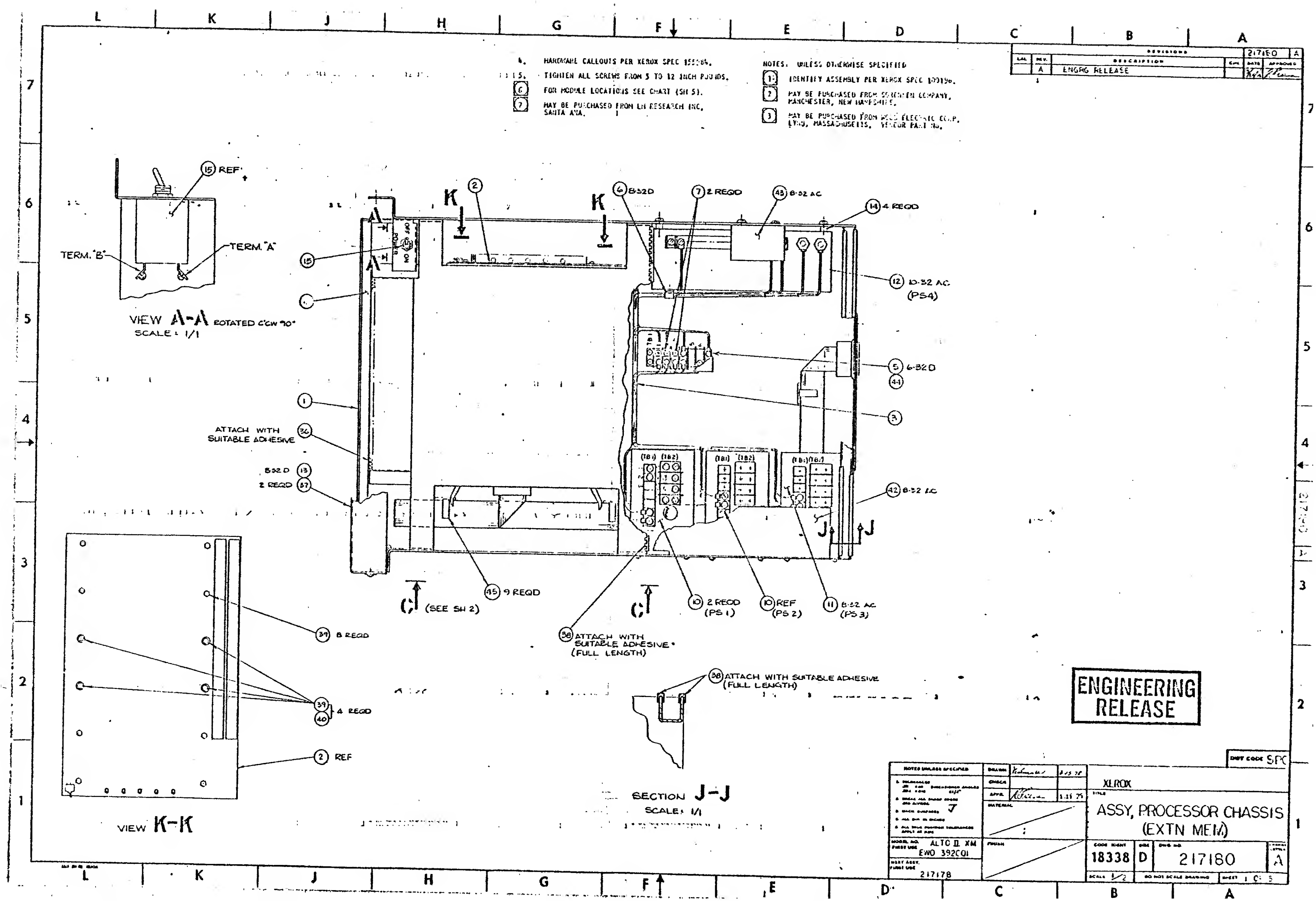
DIFF CODE SPG

XEROX

TITLE: ASSY, ALTO II SYSTEM (EXTN MEM)

MODEL OR FIRST USE	CODE IDENT	SIZE	DWG NO	LTR
ALTO II XM	18338	D	217179	A

SCALE NONE — SHEET 1 OF 3



NOTES: UNLESS OTHERWISE SPECIFIED
1 IDENTIFY ASSEMBLY PER XEROX SPEC 100196.
2 MAY BE PURCHASED FROM SCHURTER COMPANY, MANCHESTER, NEW HAMPSHIRE.
3 MAY BE PURCHASED FROM WOOD ELECTRIC CORP, LYNN, MASSACHUSETTS. VENDOR PART NO.
4. HARDWARE CALLOUTS PER XEROX SPEC 155284.
5. TIGHTEN ALL SCREWS FROM 5 TO 12 INCH POUNDS.
6 FOR MODULE LOCATIONS SEE CHART (SH 5).
7 MAY BE PURCHASED FROM LH RESEARCH INC, SANTA ANA.
REVISIONS
A ENGRG RELEASE
15 REF
TERM. "B"
TERM. "A"
VIEW A-A ROTATED C'CW 90°
SCALE: 1/1
ATTACH WITH SUITABLE ADHESIVE
8-32 D
2 REQD
4 REQD
8 REQD
REF
VIEW K-K
6 8-32 D
7 2 REQD
43 8-32 AC
14 4 REQD
12 10-32 AC (PS4)
5 6-32 D
42 8-32 AC
45 9 REQD
(SEE SH 2)
58 ATTACH WITH SUITABLE ADHESIVE (FULL LENGTH)
10 2 REQD (PS 1)
10 REF (PS 2)
11 8-32 AC (PS 3)
38 ATTACH WITH SUITABLE ADHESIVE (FULL LENGTH)
SECTION J-J
SCALE: 1/1
ENGINEERING RELEASE
XEROX
ASSY, PROCESSOR CHASSIS (EXTN MEM)
ALTO II XM
EWO 392C01
217178
18338
D
217180
A
SHEET 1 OF 5

ALTO II MODULE LOCATION CHART

		ASSEMBLY/DRAWING NUMBER	
SLOT	MODULE NAME	NORMAL ALTO II	EXTENDED MEMORY ALTO II
1	Memory Storage	216273	217187 (64K), 216644 (128K) or 217188, 217189 (256K)
2	Memory Storage	216273	217187 (64K), 216644 (128K) or 217188, 217189 (256K)
3	Memory Storage	216273	217187 (64K), 216644 (128K) or 217188, 217189 (256K)
4	Memory Storage	216273	217187 (64K), 216644 (128K) or 217188, 217189 (256K)
5			
6			
7	Bus Terminator	216421	216646
8	Memory Data Interface	216312	217115 or 217174
9	Memory Address Interface	216347	216645 or 217173
10	Control RAM	216365	216643 or 217176
11	2K Control Board	216484	216642 or 217175
12	Arithmetic Logic Unit	216381	216381
13	Display Control	216339	216339
14	Ethernet	216323	216323
15			
16			
17			
18			
19			
20			
21	Disc Control	216389	216389

+15, -15, +12 VOLT POWER SUPPLY INFORMATION

GENERAL

SSD units are equipped with two controls; the output voltage, and the overvoltage adjustment (OVP) potentiometers accessible at the terminal-board (TB1) end of the supply. The output VOLT control (R26) varies the output voltage while the OVP control (R24) sets the OVP trip point. Both are facroty-set to nominal values.

OVERVOLTAGE (OVP) TRIP POINT

The OVP trip point is factory-set to 1.2 volts or 10% (whichever is greater) higher than the rated nominal output voltage.

OVP TRIP POINT ADJUSTMENT

To adjust the OVP, proceed as follows:

1. Rotate OVP panel control R24 fully CW.
2. Rotate output VOLT control R26 on panel until the output voltage is egual to the desired trip point.
3. Rotate OVP control R24 slowly CCW until the output voltage suddenly drops to zero. This indicated that the OVP circuit has been triggered.
4. Remove the input power. Rotate VOLT control several turns CCW. Allow approximately 10 seconds for unit to discharge.
5. Apply input power. Reset output to desired operating voltage.

NOTE:
The OVP circuit inckudes a time-delay network such that the overvoltage condition must exist for approximately 100 microseconds before the OVP fires. This delay prevents short-duration overvoltage pulses from triggering the circuit.

RESET AFTER OVP FIRES

If the OVP fires, proceed to reset the circuit as follows:

1. Remove input power and disconnect load (in case overvoltage condition is externally induced). Allow approximately 10 seconds for unit to discharge.
2. Rotate VOLT adjustment R26 fully CCW (minimum voltage).
3. Apply input power and raise output voltage to desired value.

NOTE:
If the OVP trips again, internal failure is indicated, or the output is set too close to operating voltage.

LAL	Revisions Rev.	Description	Chk.	217113 A Date	Approved
	A	ENGRG RELEASE		1/13/78	R Freeman

NOTES: UNLESS OTHERWISE SPECIFIED

1. REFERENCE INTERPAK ELECTRONICS, 13536 SATICOY STREET, VAN NUYS, CALIFORNIA, WIRE LIST NO. ALTO II XM - REV A.

THIS DOCUMENT CONTAINS 20 SHEETS

Dist. Code SPG

Notes Unless Specified

1. Tolerances
   .XX ±.030 Angular ±½°
   .XXX ±.010
2. Break All Sharp Edges .010 Approx.
3. Mach. Surfaces √
4. All Dim. In Inches

Drawn	Y Ishimura	1-12-78
Check		
Appr.	R Freeman	1-13-78
Material		

Xerox Corporation
El Segundo, California

XEROX

LIST, WIRE - BACKWIRING BOARD

(EXTENDED MEMORY)

Model No. First Use	Finish	Code Ident.	Size	Dwg. No.	Change Letter
ALTO II		18338	A	217113	A
Next Assy. First Use 216652		Scale -	Do Not Scale Drawing	Sheet 1 OF	

REFERE...	MACH#	LIST#	NAME	Z	FROM	TO	AX	AY	VIAA	VIAB	BX	BY	SYSTEM	
	10622594		5ACT*	1	10J 029	11J 102	594	532	0	536	642	564	ALIIXM	A
	20622562		6ACT*	2	10J 021	11J 101	562	532	0	536	638	564	ALIIXM	A
	10652312		-DISP	1	11J 098	12J 098	312	626	622	622	336	626	ALIIXM	A
	20652408		-MD*	2	07J 096	08J 096	408	618	614	614	432	618	ALIIXM	A
	10652384		-MD*	1	08J 096	09J 096	384	618	614	614	408	618	ALIIXM	A
	20652336		-MD*	2	09J 096	11J 096	336	618	614	614	384	618	ALIIXM	A
	10652552		A(0)*	1	01J 107	02J 107	552	662	658	658	576	662	ALIIXM	A
	20652528		A(0)*	2	02J 107	03J 107	528	662	658	658	552	662	ALIIXM	A
	10652504		A(0)*	1	03J 107	04J 107	504	662	658	658	528	662	ALIIXM	A
	20621662		A(0)*	2	04J 107	05J 055	662	396	0	400	698	412	ALIIXM	A
	1065346		A(0)*	1	05J 055	06J 055	464	698	694	694	488	698	ALIIXM	A
	20653440		A(0)*	2	06J 055	07J 055	440	698	694	694	464	698	ALIIXM	A
	10653392		A(0)*	1	07J 055	09J 055	392	698	694	694	440	698	ALIIXM	A
	20652384		A(00)*	2	09J 119	04J 110	384	710	678	0	504	674	ALIIXM	A
	10652504		A(00)*	1	04J 110	03J 110	504	674	670	670	528	674	ALIIXM	A
	20652528		A(00)*	2	03J 110	02J 110	528	674	670	670	552	674	ALIIXM	A
	10652552		A(00)*	1	02J 110	01J 110	552	674	670	670	576	674	ALIIXM	A
	30621666		A(00)*	2	01J 110	01J 108	666	324	0	320	674	324	ALIIXM	A
	10652552		A(00)*	1	01J 108	02J 108	552	666	662	662	576	666	ALIIXM	A
	20652528		A(00)*	2	02J 108	03J 108	528	666	662	662	552	666	ALIIXM	A
	10652504		A(00)*	1	03J 108	04J 108	504	666	662	662	528	666	ALIIXM	A
	20621634		A(00)*	2	04J 108	04J 100	634	396	392	392	666	396	ALIIXM	A
	10652504		A(00)*	1	04J 100	03J 100	504	634	630	630	528	634	ALIIXM	A
	20652528		A(00)*	2	03J 100	02J 100	528	634	630	630	552	634	ALIIXM	A
	10652552		A(00)*	1	02J 100	01J 100	552	634	630	630	576	634	ALIIXM	A
	20621618		A(00)*	2	01J 100	01J 096	618	324	320	320	634	324	ALIIXM	A
	10652552		A(00)*	1	01J 096	02J 096	552	618	614	614	576	618	ALIIXM	A
	20652528		A(00)*	2	02J 096	03J 096	528	618	614	614	552	618	ALIIXM	A
	10652504		A(00)*	1	03J 096	04J 096	504	618	614	614	528	618	ALIIXM	A
	20621586		A(00)*	2	04J 096	04J 088	586	396	392	392	618	396	ALIIXM	A
	10652504		A(00)*	1	04J 088	03J 088	504	586	582	582	528	586	ALIIXM	A
	20652528		A(00)*	2	03J 088	02J 088	528	586	582	582	552	586	ALIIXM	A
	10652552		A(00)*	1	02J 088	01J 088	552	586	582	582	576	586	ALIIXM	A
	30621582		A(00)*	2	01J 088	01J 087	582	324	0	0	586	324	ALIIXM	A
	10652552		A(00)*	1	01J 087	02J 087	552	582	578	578	576	582	ALIIXM	A
	20652528		A(00)*	2	02J 087	03J 087	528	582	578	578	552	582	ALIIXM	A
	10652504		A(00)*	1	03J 087	04J 087	504	582	578	578	528	582	ALIIXM	A
	20652504		A(00)*	2	04J 087	01J 078	504	582	550	0	576	546	ALIIXM	A
	10652552		A(00)*	1	01J 078	02J 078	552	546	542	542	576	546	ALIIXM	A
	20652528		A(00)*	2	02J 078	03J 078	528	546	542	542	552	546	ALIIXM	A
	10652504		A(00)*	1	03J 078	04J 078	504	546	542	542	528	546	ALIIXM	A
	20621510		A(00)*	2	04J 078	04J 069	510	396	392	392	546	396	ALIIXM	A
	10652504		A(00)*	1	04J 069	03J 069	504	510	506	506	528	510	ALIIXM	A
	20652528		A(00)*	2	03J 069	02J 069	528	510	506	506	552	510	ALIIXM	A
	10652552		A(00)*	1	02J 069	01J 069	552	510	506	506	576	510	ALIIXM	A
	20652552		A(1)*	2	01J 095	02J 095	552	614	610	610	576	614	ALIIXM	A
	10652528		A(1)*	1	02J 095	03J 095	528	614	610	610	552	614	ALIIXM	A
	20652504		A(1)*	2	03J 095	04J 095	504	614	610	610	528	614	ALIIXM	A
	10621614		A(1)*	1	04J 095	05J 056	614	396	0	400	702	412	ALIIXM	A
	20653464		A(1)*	2	05J 056	06J 056	464	702	698	698	488	702	ALIIXM	A

REFERENCE	MACH=	LIST=	NAME	Z	FROM	TO	AX	AY	VIAA	VIAB	BX	BY	SYSTEM	REV
	10653440		A(1)*	1	06J 056	07J 0[illegible]	440	702	698	698	464	702	ALIIXM	A
	20653392		A(1)*	2	07J 056	09J 0[illegible]	392	702	698	698	440	702	ALIIXM	A
	10652552		A(2)*	1	01J 085	02J 085	552	574	570	570	576	574	ALIIXM	A
	20652528		A(2)*	2	02J 085	03J 085	528	574	570	570	552	574	ALIIXM	A
	10652504		A(2)*	1	03J 085	04J 085	504	574	570	570	528	574	ALIIXM	A
	20621574		A(2)*	2	04J 085	05J 057	574	396	0	400	706	412	ALIIXM	A
	10653464		A(2)*	1	05J 057	06J 057	464	706	702	702	488	706	ALIIXM	A
	20653440		A(2)*	2	06J 057	07J 057	440	706	702	702	464	706	ALIIXM	A
	10653392		A(2)*	1	07J 057	09J 057	392	706	702	702	440	706	ALIIXM	A
	20652552		A(3)*	2	01J 077	02J 077	552	542	538	538	576	542	ALIIXM	A
	10652528		A(3)*	1	02J 077	03J 077	528	542	538	538	552	542	ALIIXM	A
	20652504		A(3)*	2	03J 077	04J 077	504	542	538	538	528	542	ALIIXM	A
	10621542		A(3)*	1	04J 077	05J 058	542	396	0	400	710	412	ALIIXM	A
	20653464		A(3)*	2	05J 058	06J 058	464	710	706	706	488	710	ALIIXM	A
	10653440		A(3)*	1	06J 058	07J 058	440	710	706	706	464	710	ALIIXM	A
	20653392		A(3)*	2	07J 058	09J 058	392	710	706	706	440	710	ALIIXM	A
	10652552		A(4)*	1	01J 067	02J 067	552	502	498	498	576	502	ALIIXM	A
	20652528		A(4)*	2	02J 067	03J 067	528	502	498	498	552	502	ALIIXM	A
	10652504		A(4)*	1	03J 067	04J 067	504	502	498	498	528	502	ALIIXM	A
	20621502		A(4)*	2	04J 067	05J 059	502	396	0	400	714	412	ALIIXM	A
	10653464		A(4)*	1	05J 059	06J 059	464	714	710	710	488	714	ALIIXM	A
	20653440		A(4)*	2	06J 059	07J 059	440	714	710	710	464	714	ALIIXM	A
	10653392		A(4)*	1	07J 059	09J 059	392	714	710	710	440	714	ALIIXM	A
	20652552		A(5)*	2	01J 105	02J 105	552	654	650	650	576	654	ALIIXM	A
	10652528		A(5)*	1	02J 105	03J 105	528	654	650	650	552	654	ALIIXM	A
	20652504		A(5)*	2	03J 105	04J 105	504	654	650	650	528	654	ALIIXM	A
	10621654		A(5)*	1	04J 105	05J 060	654	396	0	400	718	412	ALIIXM	A
	20653464		A(5)*	2	05J 060	06J 060	464	718	714	714	488	718	ALIIXM	A
	10653440		A(5)*	1	06J 060	07J 060	440	718	714	714	464	718	ALIIXM	A
	20653392		A(5)*	2	07J 060	09J 060	392	718	714	714	440	718	ALIIXM	A
	10652320		ALUF(0)	1	11J 040	12J 040	320	638	634	634	344	638	ALIIXM	A
	20652320		ALUF(1)	2	11J 041	12J 041	320	642	638	638	344	642	ALIIXM	A
	10652320		ALUF(2)	1	11J 042	12J 042	320	646	642	642	344	646	ALIIXM	A
	20652320		ALUF(3)	2	11J 043	12J 043	320	650	646	646	344	650	ALIIXM	A
	10652360		ALU(00)	1	09J 100	10J 100	360	634	630	630	384	634	ALIIXM	A
	20652312		ALU(00)	2	10J 100	12J 100	312	634	630	630	360	634	ALIIXM	A
	10652360		ALU(01)	1	09J 101	10J 101	360	638	634	634	384	638	ALIIXM	A
	20652312		ALU(01)	2	10J 101	12J 101	312	638	634	634	360	638	ALIIXM	A
	10652360		ALU(02)	1	09J 102	10J 102	360	642	638	638	384	642	ALIIXM	A
	20652312		ALU(02)	2	10J 102	12J 102	312	642	638	638	360	642	ALIIXM	A
	10652360		ALU(03)	1	09J 103	10J 103	360	646	642	642	384	646	ALIIXM	A
	20652312		ALU(03)	2	10J 103	12J 103	312	646	642	642	360	646	ALIIXM	A
	10652360		ALU(04)	1	09J 104	10J 104	360	650	646	646	384	650	ALIIXM	A
	20652312		ALU(04)	2	10J 104	12J 104	312	650	646	646	360	650	ALIIXM	A
	10652360		ALU(05)	1	09J 105	10J 105	360	654	650	650	384	654	ALIIXM	A
	20652312		ALU(05)	2	10J 105	12J 105	312	654	650	650	360	654	ALIIXM	A

REFE	E	MACH=	LIST=	NAME	Z	FROM		AX	AY	VIAA	VIAB	BX	BY	SYSTEM	REV
		10652360		ALU(06)	1	09J 106	10J 106	360	658	654	654	384	658	ALIIXM	A
		20652312		ALU(06)	2	10J 106	12J 106	312	658	654	654	360	658	ALIIXM	A
		10652360		ALU(07)	1	09J 107	10J 107	360	662	658	658	384	662	ALIIXM	A
		20652312		ALU(07)	2	10J 107	12J 107	312	662	658	658	360	662	ALIIXM	A
		10652360		ALU(08)	1	09J 108	10J 108	360	666	662	662	384	666	ALIIXM	A
		20652312		ALU(08)	2	10J 108	12J 108	312	666	662	662	360	666	ALIIXM	A
		10652360		ALU(09)	1	09J 109	10J 109	360	670	666	666	384	670	ALIIXM	A
		20652312		ALU(09)	2	10J 109	12J 109	312	670	666	666	360	670	ALIIXM	A
		10652360		ALU(10)	1	09J 110	10J 110	360	674	670	670	384	674	ALIIXM	A
		20652312		ALU(10)	2	10J 110	12J 110	312	674	670	670	360	674	ALIIXM	A
		10653360		ALU(11)	1	09J 111	10J 111	360	678	674	674	384	678	ALIIXM	A
		20653312		ALU(11)	2	10J 111	12J 111	312	678	674	674	360	678	ALIIXM	A
		10653360		ALU(12)	1	09J 112	10J 112	360	682	678	678	384	682	ALIIXM	A
		20653312		ALU(12)	2	10J 112	12J 112	312	682	678	678	360	682	ALIIXM	A
		10653360		ALU(13)	1	09J 113	10J 113	360	686	682	682	384	686	ALIIXM	A
		20653312		ALU(13)	2	10J 113	12J 113	312	686	682	682	360	686	ALIIXM	A
		10653360		ALU(14)	1	09J 114	10J 114	360	690	686	686	384	690	ALIIXM	A
		20653312		ALU(14)	2	10J 114	12J 114	312	690	686	686	360	690	ALIIXM	A
		10653360		ALU(15)	1	09J 115	10J 115	360	694	690	690	384	694	ALIIXM	A
		20653312		ALU(15)	2	10J 115	12J 115	312	694	690	690	360	694	ALIIXM	A
		10652288		AUSYSCLK	1	12J 072	13J 072	288	522	518	518	312	522	ALIIXM	A
		20652264		AUSYSCLK	2	13J 072	14J 072	264	522	518	518	288	522	ALIIXM	A
		10652320		AUSYSCLK*	1	11J 008	12J 008	320	510	506	506	344	510	ALIIXM	A
		20652296		AUSYSCLK*	2	12J 008	13J 008	296	510	506	506	320	510	ALIIXM	A
		10652272		AUSYSCLK*	1	13J 008	14J 012	272	526	514	0	296	510	ALIIXM	A
		20652096		AUSYSCLK*	2	14J 012	21J 075	96	534	530	0	272	526	ALIIXM	A
		10652392		BANKSEL0	1	07J 028	09J 021	392	562	0	566	440	590	ALIIXM	A
		20652392		BANKSEL1	2	07J 031	09J 020	392	558	0	562	440	602	ALIIXM	A
		10622522		BK0	1	08J 032	09J 011	522	508	488	0	606	484	ALIIXM	A
		20622526		BK1	2	08J 033	09J 012	526	508	488	0	610	484	ALIIXM	A
		10652336		BLOCK*	1	09J 099	11J 110	336	674	634	0	384	630	ALIIXM	A
		20652288		BLOCK*	2	11J 110	13J 110	288	674	670	670	336	674	ALIIXM	A
		10652096		BLOCK*	1	13J 110	21J 110	96	674	670	670	288	674	ALIIXM	A
		20652320		BSZ0	2	11J 044	12J 044	320	654	650	650	344	654	ALIIXM	A
		10653336		BS0	1	09J 120	11J 120	336	714	710	710	384	714	ALIIXM	A
		20653336		BS1	2	09J 121	11J 121	336	718	714	714	384	718	ALIIXM	A
		10653336		BS2	1	09J 122	11J 122	336	722	718	718	384	722	ALIIXM	A

REFERENCE	MACH=	LIST=	NAME	Z	FROM	TO	AX	AY	VIAA	VIAB	BX	BY	SYSTEM	REV
	20652408		BUS(001)	2	07J 080	08J 080	408	554	550	550	432	554	ALIIXM	A
	10652384		BUS(001)	1	08J 080	09J 080	384	554	550	550	408	554	ALIIXM	A
	20652360		BUS(001)	2	09J 080	10J 080	360	554	550	550	384	554	ALIIXM	A
	10652336		BUS(001)	1	10J 080	11J 080	336	554	550	550	360	554	ALIIXM	A
	20652312		BUS(001)	2	11J 080	12J 080	312	554	550	550	336	554	ALIIXM	A
	10652288		BUS(001)	1	12J 080	13J 080	288	554	550	550	312	554	ALIIXM	A
	20652264		BUS(001)	2	13J 080	14J 080	264	554	550	550	288	554	ALIIXM	A
	10652240		BUS(001)	1	14J 080	15J 080	240	554	550	550	264	554	ALIIXM	A
	20652216		BUS(001)	2	15J 080	16J 080	216	554	550	550	240	554	ALIIXM	A
	10652192		BUS(001)	1	16J 080	17J 080	192	554	550	550	216	554	ALIIXM	A
	20652168		BUS(001)	2	17J 080	18J 080	168	554	550	550	192	554	ALIIXM	A
	10652144		BUS(001)	1	18J 080	19J 080	144	554	550	550	168	554	ALIIXM	A
	20652120		BUS(001)	2	19J 080	20J 080	120	554	550	550	144	554	ALIIXM	A
	10652096		BUS(001)	1	20J 080	21J 080	96	554	550	550	120	554	ALIIXM	A
	20652408		BUS(01)	2	07J 081	08J 081	408	558	554	554	432	558	ALIIXM	A
	10652384		BUS(01)	1	08J 081	09J 081	384	558	554	554	408	558	ALIIXM	A
	20652360		BUS(01)	2	09J 081	10J 081	360	558	554	554	384	558	ALIIXM	A
	10652336		BUS(01)	1	10J 081	11J 081	336	558	554	554	360	558	ALIIXM	A
	20652312		BUS(01)	2	11J 081	12J 081	312	558	554	554	336	558	ALIIXM	A
	10652288		BUS(01)	1	12J 081	13J 081	288	558	554	554	312	558	ALIIXM	A
	20652264		BUS(01)	2	13J 081	14J 081	264	558	554	554	288	558	ALIIXM	A
	10652240		BUS(01)	1	14J 081	15J 081	240	558	554	554	264	558	ALIIXM	A
	20652216		BUS(01)	2	15J 081	16J 081	216	558	554	554	240	558	ALIIXM	A
	10652192		BUS(01)	1	16J 081	17J 081	192	558	554	554	216	558	ALIIXM	A
	20652168		BUS(01)	2	17J 081	18J 081	168	558	554	554	192	558	ALIIXM	A
	10652144		BUS(01)	1	18J 081	19J 081	144	558	554	554	168	558	ALIIXM	A
	20652120		BUS(01)	2	19J 081	20J 081	120	558	554	554	144	558	ALIIXM	A
	10652096		BUS(01)	1	20J 081	21J 081	96	558	554	554	120	558	ALIIXM	A
	20652408		BUS(02)	2	07J 082	08J 082	408	562	558	558	432	562	ALIIXM	A
	10652384		BUS(02)	1	08J 082	09J 082	384	562	558	558	408	562	ALIIXM	A
	20652360		BUS(02)	2	09J 082	10J 082	360	562	558	558	384	562	ALIIXM	A
	10652336		BUS(02)	1	10J 082	11J 082	336	562	558	558	360	562	ALIIXM	A
	20652312		BUS(02)	2	11J 082	12J 082	312	562	558	558	336	562	ALIIXM	A
	10652288		BUS(02)	1	12J 082	13J 082	288	562	558	558	312	562	ALIIXM	A
	20652264		BUS(02)	2	13J 082	14J 082	264	562	558	558	288	562	ALIIXM	A
	10652240		BUS(02)	1	14J 082	15J 082	240	562	558	558	264	562	ALIIXM	A
	20652216		BUS(02)	2	15J 082	16J 082	216	562	558	558	240	562	ALIIXM	A
	10652192		BUS(02)	1	16J 082	17J 082	192	562	558	558	216	562	ALIIXM	A
	20652168		BUS(02)	2	17J 082	18J 082	168	562	558	558	192	562	ALIIXM	A
	10652144		BUS(02)	1	18J 082	19J 082	144	562	558	558	168	562	ALIIXM	A
	20652120		BUS(02)	2	19J 082	20J 082	120	562	558	558	144	562	ALIIXM	A
	10652096		BUS(02)	1	20J 082	21J 082	96	562	558	558	120	562	ALIIXM	A
	20652408		BUS(03)	2	07J 083	08J 083	408	566	562	562	432	566	ALIIXM	A
	10652384		BUS(03)	1	08J 083	09J 083	384	566	562	562	408	566	ALIIXM	A
	20652360		BUS(03)	2	09J 083	10J 083	360	566	562	562	384	566	ALIIXM	A
	10652336		BUS(03)	1	10J 083	11J 083	336	566	562	562	360	566	ALIIXM	A
	20652312		BUS(03)	2	11J 083	12J 083	312	566	562	562	336	566	ALIIXM	A
	10652288		BUS(03)	1	12J 083	13J 083	288	566	562	562	312	566	ALIIXM	A
	20652264		BUS(03)	2	13J 083	14J 083	264	566	562	562	288	566	ALIIXM	A
	10652240		BUS(03)	1	14J 083	15J 083	240	566	562	562	264	566	ALIIXM	A
	20652216		BUS(03)	2	15J 083	16J 083	216	566	562	562	240	566	ALIIXM	A
	10652192		BUS(03)	1	16J 083	17J 083	192	566	562	562	216	566	ALIIXM	A
	20652168		BUS(03)	2	17J 083	18J 083	168	566	562	562	192	566	ALIIXM	A
	10652144		BUS(03)	1	18J 083	19J 083	144	566	562	562	168	566	ALIIXM	A
	20652120		BUS(03)	2	19J 083	20J 083	120	566	562	562	144	566	ALIIXM	A
	10652096		BUS(03)	1	20J 083	21J 083	96	566	562	562	120	566	ALIIXM	A

REFERENCE	MACH#	LIST#	NAME	Z	FROM	TO	AX	AY	VIAA	VIAB	BX	BY	SYSTEM	REV
	20652408		BUS(04)	2	07J 084	08J 084	408	570	566	566	432	570	ALIIXM	A
	10652384		BUS(04)	1	08J 084	09J 084	384	570	566	566	408	570	ALIIXM	A
	20652360		BUS(04)	2	09J 084	10J 084	360	570	566	566	384	570	ALIIXM	A
	10652336		BUS(04)	1	10J 084	11J 084	336	570	566	566	360	570	ALIIXM	A
	20652312		BUS(04)	2	11J 084	12J 084	312	570	566	566	336	570	ALIIXM	A
	10652288		BUS(04)	1	12J 084	13J 084	288	570	566	566	312	570	ALIIXM	A
	20652264		BUS(04)	2	13J 084	14J 084	264	570	566	566	288	570	ALIIXM	A
	10652240		BUS(04)	1	14J 084	15J 084	240	570	566	566	264	570	ALIIXM	A
	20652216		BUS(04)	2	15J 084	16J 084	216	570	566	566	240	570	ALIIXM	A
	10652192		BUS(04)	1	16J 084	17J 084	192	570	566	566	216	570	ALIIXM	A
	20652168		BUS(04)	2	17J 084	18J 084	168	570	566	566	192	570	ALIIXM	A
	10652144		BUS(04)	1	18J 084	19J 084	144	570	566	566	168	570	ALIIXM	A
	20652120		BUS(04)	2	19J 084	20J 084	120	570	566	566	144	570	ALIIXM	A
	10652096		BUS(04)	1	20J 084	21J 084	96	570	566	566	120	570	ALIIXM	A
	20652408		BUS(05)	2	07J 085	08J 085	408	574	570	570	432	574	ALIIXM	A
	10652384		BUS(05)	1	08J 085	09J 085	384	574	570	570	408	574	ALIIXM	A
	20652360		BUS(05)	2	09J 085	10J 085	360	574	570	570	384	574	ALIIXM	A
	10652336		BUS(05)	1	10J 085	11J 085	336	574	570	570	360	574	ALIIXM	A
	20652312		BUS(05)	2	11J 085	12J 085	312	574	570	570	336	574	ALIIXM	A
	10652288		BUS(05)	1	12J 085	13J 085	288	574	570	570	312	574	ALIIXM	A
	20652264		BUS(05)	2	13J 085	14J 085	264	574	570	570	288	574	ALIIXM	A
	10652240		BUS(05)	1	14J 085	15J 085	240	574	570	570	264	574	ALIIXM	A
	20652216		BUS(05)	2	15J 085	16J 085	216	574	570	570	240	574	ALIIXM	A
	10652192		BUS(05)	1	16J 085	17J 085	192	574	570	570	216	574	ALIIXM	A
	20652168		BUS(05)	2	17J 085	18J 085	168	574	570	570	192	574	ALIIXM	A
	10652144		BUS(05)	1	18J 085	19J 085	144	574	570	570	168	574	ALIIXM	A
	20652120		BUS(05)	2	19J 085	20J 085	120	574	570	570	144	574	ALIIXM	A
	10652096		BUS(05)	1	20J 085	21J 085	96	574	570	570	120	574	ALIIXM	A
	20652408		BUS(06)	2	07J 086	08J 086	408	578	574	574	432	578	ALIIXM	A
	10652384		BUS(06)	1	08J 086	09J 086	384	578	574	574	408	578	ALIIXM	A
	20652360		BUS(06)	2	09J 086	10J 086	360	578	574	574	384	578	ALIIXM	A
	10652336		BUS(06)	1	10J 086	11J 086	336	578	574	574	360	578	ALIIXM	A
	20652312		BUS(06)	2	11J 086	12J 086	312	578	574	574	336	578	ALIIXM	A
	10652288		BUS(06)	1	12J 086	13J 086	288	578	574	574	312	578	ALIIXM	A
	20652264		BUS(06)	2	13J 086	14J 086	264	578	574	574	288	578	ALIIXM	A
	1065224		BUS(06)	1	14J 086	15J 086	240	578	574	574	264	578	ALIIXM	A
	20652216		BUS(06)	2	15J 086	16J 086	216	578	574	574	240	578	ALIIXM	A
	10652192		BUS(06)	1	16J 086	17J 086	192	578	574	574	216	578	ALIIXM	A
	20652168		BUS(06)	2	17J 086	18J 086	168	578	574	574	192	578	ALIIXM	A
	10652144		BUS(06)	1	18J 086	19J 086	144	578	574	574	168	578	ALIIXM	A
	20652120		BUS(06)	2	19J 086	20J 086	120	578	574	574	144	578	ALIIXM	A
	10652096		BUS(06)	1	20J 086	21J 086	96	578	574	574	120	578	ALIIXM	A
	20652408		BUS(07)	2	07J 087	08J 087	408	582	578	578	432	582	ALIIXM	A
	10652384		BUS(07)	1	08J 087	09J 087	384	582	578	578	408	582	ALIIXM	A
	20652360		BUS(07)	2	09J 087	10J 087	360	582	578	578	384	582	ALIIXM	A
	10652336		BUS(07)	1	10J 087	11J 087	336	582	578	578	360	582	ALIIXM	A
	20652312		BUS(07)	2	11J 087	12J 087	312	582	578	578	336	582	ALIIXM	A
	10652288		BUS(07)	1	12J 087	13J 087	288	582	578	578	312	582	ALIIXM	A
	20652264		BUS(07)	2	13J 087	14J 087	264	582	578	578	288	582	ALIIXM	A
	10652240		BUS(07)	1	14J 087	15J 087	240	582	578	578	264	582	ALIIXM	A
	20652216		BUS(07)	2	15J 087	16J 087	216	582	578	578	240	582	ALIIXM	A
	10652192		BUS(07)	1	16J 087	17J 087	192	582	578	578	216	582	ALIIXM	A
	20652168		BUS(07)	2	17J 087	18J 087	168	582	578	578	192	582	ALIIXM	A
	10652144		BUS(07)	1	18J 087	19J 087	144	582	578	578	168	582	ALIIXM	A
	20652120		BUS(07)	2	19J 087	20J 087	120	582	578	578	144	582	ALIIXM	A
	10652096		BUS(07)	1	20J 087	21J 087	96	582	578	578	120	582	ALIIXM	A

MACH=	NAME	Z	FROM	TO	AX	AY	VIAA	VIAB	BX	BY	SYSTEM	REV
20652408	BUS(08)	2	07J 088	08J 088	408	586	582	582	432	586	ALIIXM	A
10652384	BUS(08)	1	08J 088	09J 088	384	586	582	582	408	586	ALIIXM	A
20652360	BUS(08)	2	09J 088	10J 088	360	586	582	582	384	586	ALIIXM	A
10652336	BUS(08)	1	10J 088	11J 088	336	586	582	582	360	586	ALIIXM	A
20652312	BUS(08)	2	11J 088	12J 088	312	586	582	582	336	586	ALIIXM	A
10652288	BUS(08)	1	12J 088	13J 088	288	586	582	582	312	586	ALIIXM	A
20652264	BUS(08)	2	13J 088	14J 088	264	586	582	582	288	586	ALIIXM	A
10652240	BUS(08)	1	14J 088	15J 088	240	586	582	582	264	586	ALIIXM	A
20652216	BUS(08)	2	15J 088	16J 088	216	586	582	582	240	586	ALIIXM	A
10652192	BUS(08)	1	16J 088	17J 088	192	586	582	582	216	586	ALIIXM	A
20652168	BUS(08)	2	17J 088	18J 088	168	586	582	582	192	586	ALIIXM	A
10652144	BUS(08)	1	18J 088	19J 088	144	586	582	582	168	586	ALIIXM	A
20652120	BUS(08)	2	19J 088	20J 088	120	586	582	582	144	586	ALIIXM	A
10652096	BUS(08)	1	20J 088	21J 088	96	586	582	582	120	586	ALIIXM	A
20652408	BUS(09)	2	07J 089	08J 089	408	590	586	586	432	590	ALIIXM	A
10652384	BUS(09)	1	08J 089	09J 089	384	590	586	586	408	590	ALIIXM	A
20652360	BUS(09)	2	09J 089	10J 089	360	590	586	586	384	590	ALIIXM	A
10652336	BUS(09)	1	10J 089	11J 089	336	590	586	586	360	590	ALIIXM	A
20652312	BUS(09)	2	11J 089	12J 089	312	590	586	586	336	590	ALIIXM	A
10652288	BUS(09)	1	12J 089	13J 089	288	590	586	586	312	590	ALIIXM	A
20652264	BUS(09)	2	13J 089	14J 089	264	590	586	586	288	590	ALIIXM	A
10652240	BUS(09)	1	14J 089	15J 089	240	590	586	586	264	590	ALIIXM	A
20652216	BUS(09)	2	15J 089	16J 089	216	590	586	586	240	590	ALIIXM	A
10652192	BUS(09)	1	16J 089	17J 089	192	590	586	586	216	590	ALIIXM	A
20652168	BUS(09)	2	17J 089	18J 089	168	590	586	586	192	590	ALIIXM	A
10652144	BUS(09)	1	18J 089	19J 089	144	590	586	586	168	590	ALIIXM	A
20652120	BUS(09)	2	19J 089	20J 089	120	590	586	586	144	590	ALIIXM	A
10652096	BUS(09)	1	20J 089	21J 089	96	590	586	586	120	590	ALIIXM	A
20652408	BUS(10)	2	07J 090	08J 090	408	594	590	590	432	594	ALIIXM	A
10652384	BUS(10)	1	08J 090	09J 090	384	594	590	590	408	594	ALIIXM	A
20652360	BUS(10)	2	09J 090	10J 090	360	594	590	590	384	594	ALIIXM	A
10652336	BUS(10)	1	10J 090	11J 090	336	594	590	590	360	594	ALIIXM	A
20652312	BUS(10)	2	11J 090	12J 090	312	594	590	590	336	594	ALIIXM	A
10652288	BUS(10)	1	12J 090	13J 090	288	594	590	590	312	594	ALIIXM	A
20652264	BUS(10)	2	13J 090	14J 090	264	594	590	590	288	594	ALIIXM	A
10652240	BUS(10)	1	14J 090	15J 090	240	594	590	590	264	594	ALIIXM	A
20652216	BUS(10)	2	15J 090	16J 090	216	594	590	590	240	594	ALIIXM	A
10652192	BUS(10)	1	16J 090	17J 090	192	594	590	590	216	594	ALIIXM	A
20652168	BUS(10)	2	17J 090	18J 090	168	594	590	590	192	594	ALIIXM	A
10652144	BUS(10)	1	18J 090	19J 090	144	594	590	590	168	594	ALIIXM	A
20652120	BUS(10)	2	19J 090	20J 090	120	594	590	590	144	594	ALIIXM	A
10652096	BUS(10)	1	20J 090	21J 090	96	594	590	590	120	594	ALIIXM	A
20652408	BUS(11)	2	07J 091	08J 091	408	598	594	594	432	598	ALIIXM	A
10652384	BUS(11)	1	08J 091	09J 091	384	598	594	594	408	598	ALIIXM	A
20652360	BUS(11)	2	09J 091	10J 091	360	598	594	594	384	598	ALIIXM	A
10652336	BUS(11)	1	10J 091	11J 091	336	598	594	594	360	598	ALIIXM	A
20652312	BUS(11)	2	11J 091	12J 091	312	598	594	594	336	598	ALIIXM	A
10652288	BUS(11)	1	12J 091	13J 091	288	598	594	594	312	598	ALIIXM	A
20652264	BUS(11)	2	13J 091	14J 091	264	598	594	594	288	598	ALIIXM	A
10652240	BUS(11)	1	14J 091	15J 091	240	598	594	594	264	598	ALIIXM	A
20652216	BUS(11)	2	15J 091	16J 091	216	598	594	594	240	598	ALIIXM	A
10652192	BUS(11)	1	16J 091	17J 091	192	598	594	594	216	598	ALIIXM	A
20652168	BUS(11)	2	17J 091	18J 091	168	598	594	594	192	598	ALIIXM	A
10652144	BUS(11)	1	18J 091	19J 091	144	598	594	594	168	598	ALIIXM	A
20652120	BUS(11)	2	19J 091	20J 091	120	598	594	594	144	598	ALIIXM	A
10652096	BUS(11)	1	20J 091	21J 091	96	598	594	594	120	598	ALIIXM	A

REFERENCE	MACH#	LIST#	NAME	Z	FROM	TO	AX	AY	VIAA	VIAB	BX	BY	SYSTEM	REV
	20652408		BUS(12)	2	07J 092	08J 092	408	602	598	598	432	602	ALIIXM	A
	10652384		BUS(12)	1	08J 092	09J 092	384	602	598	598	408	602	ALIIXM	A
	20652360		BUS(12)	2	09J 092	10J 092	360	602	598	598	384	602	ALIIXM	A
	10652336		BUS(12)	1	10J 092	11J 092	336	602	598	598	360	602	ALIIXM	A
	20652312		BUS(12)	2	11J 092	12J 092	312	602	598	598	336	602	ALIIXM	A
	10652288		BUS(12)	1	12J 092	13J 092	288	602	598	598	312	602	ALIIXM	A
	20652264		BUS(12)	2	13J 092	14J 092	264	602	598	598	288	602	ALIIXM	A
	10652240		BUS(12)	1	14J 092	15J 092	240	602	598	598	264	602	ALIIXM	A
	20652216		BUS(12)	2	15J 092	16J 092	216	602	598	598	240	602	ALIIXM	A
	10652192		BUS(12)	1	16J 092	17J 092	192	602	598	598	216	602	ALIIXM	A
	20652168		BUS(12)	2	17J 092	18J 092	168	602	598	598	192	602	ALIIXM	A
	10652144		BUS(12)	1	18J 092	19J 092	144	602	598	598	168	602	ALIIXM	A
	20652120		BUS(12)	2	19J 092	20J 092	120	602	598	598	144	602	ALIIXM	A
	10652096		BUS(12)	1	20J 092	21J 092	96	602	598	598	120	602	ALIIXM	A
	20652408		BUS(13)	2	07J 093	08J 093	408	606	602	602	432	606	ALIIXM	A
	10652384		BUS(13)	1	08J 093	09J 093	384	606	602	602	408	606	ALIIXM	A
	20652360		BUS(13)	2	09J 093	10J 093	360	606	602	602	384	606	ALIIXM	A
	10652336		BUS(13)	1	10J 093	11J 093	336	606	602	602	360	606	ALIIXM	A
	20652312		BUS(13)	2	11J 093	12J 093	312	606	602	602	336	606	ALIIXM	A
	10652288		BUS(13)	1	12J 093	13J 093	288	606	602	602	312	606	ALIIXM	A
	20652264		BUS(13)	2	13J 093	14J 093	264	606	602	602	288	606	ALIIXM	A
	10652240		BUS(13)	1	14J 093	15J 093	240	606	602	602	264	606	ALIIXM	A
	20652216		BUS(13)	2	15J 093	16J 093	216	606	602	602	240	606	ALIIXM	A
	10652192		BUS(13)	1	16J 093	17J 093	192	606	602	602	216	606	ALIIXM	A
	20652168		BUS(13)	2	17J 093	18J 093	168	606	602	602	192	606	ALIIXM	A
	10652144		BUS(13)	1	18J 093	19J 093	144	606	602	602	168	606	ALIIXM	A
	20652120		BUS(13)	2	19J 093	20J 093	120	606	602	602	144	606	ALIIXM	A
	10652096		BUS(13)	1	20J 093	21J 093	96	606	602	602	120	606	ALIIXM	A
	20652408		BUS(14)	2	07J 094	08J 094	408	610	606	606	432	610	ALIIXM	A
	10652384		BUS(14)	1	08J 094	09J 094	384	610	606	606	408	610	ALIIXM	A
	20652360		BUS(14)	2	09J 094	10J 094	360	610	606	606	384	610	ALIIXM	A
	10652336		BUS(14)	1	10J 094	11J 094	336	610	606	606	360	610	ALIIXM	A
	20652312		BUS(14)	2	11J 094	12J 094	312	610	606	606	336	610	ALIIXM	A
	10652288		BUS(14)	1	12J 094	13J 094	288	610	606	606	312	610	ALIIXM	A
	20652264		BUS(14)	2	13J 094	14J 094	264	610	606	606	288	610	ALIIXM	A
	10652240		BUS(14)	1	14J 094	15J 094	240	610	606	606	264	610	ALIIXM	A
	20652216		BUS(14)	2	15J 094	16J 094	216	610	606	606	240	610	ALIIXM	A
	10652192		BUS(14)	1	16J 094	17J 094	192	610	606	606	216	610	ALIIXM	A
	20652168		BUS(14)	2	17J 094	18J 094	168	610	606	606	192	610	ALIIXM	A
	10652144		BUS(14)	1	18J 094	19J 094	144	610	606	606	168	610	ALIIXM	A
	20652120		BUS(14)	2	19J 094	20J 094	120	610	606	606	144	610	ALIIXM	A
	10652096		BUS(14)	1	20J 094	21J 094	96	610	606	606	120	610	ALIIXM	A
	20652408		BUS(15)	2	07J 095	08J 095	408	614	610	610	432	614	ALIIXM	A
	10652384		BUS(15)	1	08J 095	09J 095	384	614	610	610	408	614	ALIIXM	A
	20652360		BUS(15)	2	09J 095	10J 095	360	614	610	610	384	614	ALIIXM	A
	10652336		BUS(15)	1	10J 095	11J 095	336	614	610	610	360	614	ALIIXM	A
	20652312		BUS(15)	2	11J 095	12J 095	312	614	610	610	336	614	ALIIXM	A
	10652288		BUS(15)	1	12J 095	13J 095	288	614	610	610	312	614	ALIIXM	A
	20652264		BUS(15)	2	13J 095	14J 095	264	614	610	610	288	614	ALIIXM	A
	10652240		BUS(15)	1	14J 095	15J 095	240	614	610	610	264	614	ALIIXM	A
	20652216		BUS(15)	2	15J 095	16J 095	216	614	610	610	240	614	ALIIXM	A
	10652192		BUS(15)	1	16J 095	17J 095	192	614	610	610	216	614	ALIIXM	A
	20652168		BUS(15)	2	17J 095	18J 095	168	614	610	610	192	614	ALIIXM	A
	10652144		BUS(15)	1	18J 095	19J 095	144	614	610	610	168	614	ALIIXM	A
	20652120		BUS(15)	2	19J 095	20J 095	120	614	610	610	144	614	ALIIXM	A
	10652096		BUS(15)	1	20J 095	21J 095	96	614	610	610	120	614	ALIIXM	A

REFERENCE	MACH=	LIST=	NAME	Z	FROM	TO							
	20622558		BUS=2*	2	11J 020	15J 11	558	556	0	560	686	660	ALIIXM A
	10653216		BUS=2*	1	15J 113	16J 11	216	686	682	682	240	686	ALIIXM A
	20653192		BUS=2*	2	16J 113	17J 113	192	686	682	682	216	686	ALIIXM A
	10653168		BUS=2*	1	17J 113	18J 113	168	686	682	682	192	686	ALIIXM A
	20653144		BUS=2*	2	18J 113	19J 113	144	686	682	682	168	686	ALIIXM A
	10653120		BUS=2*	1	19J 113	20J 113	120	686	682	682	144	686	ALIIXM A
	20652552		CAS	2	01J 089	02J 089	552	590	586	586	576	590	ALIIXM A
	10652528		CAS	1	02J 089	03J 089	528	590	586	586	552	590	ALIIXM A
	20652504		CAS	2	03J 089	04J 089	504	590	586	586	528	590	ALIIXM A
	10652392		CAS	1	04J 089	09J 041	392	642	594	0	504	590	ALIIXM A
	20652360		CONST*	2	09J 097	10J 097	360	622	618	618	384	622	ALIIXM A
	10652336		CONST*	1	10J 097	11J 097	336	622	618	618	360	622	ALIIXM A
	20622606		CURTAC*	2	10J 032	11J 114	606	532	0	536	690	564	ALIIXM A
	10653288		CURTAC*	1	11J 114	13J 114	288	690	686	686	336	690	ALIIXM A
	20631540		DBARC	2	10J 063	11J 063	540	414	410	410	564	414	ALIIXM A
	10631564		DBARC	1	11J 063	13J 063	564	414	410	410	612	414	ALIIXM A
	20631612		DBARC	2	13J 063	14J 063	612	414	410	410	636	414	ALIIXM A
	10631636		DBARC	1	14J 063	15J 063	636	414	410	410	660	414	ALIIXM A
	20631660		DBARC	2	15J 063	16J 063	660	414	410	410	684	414	ALIIXM A
	10631684		DBARC	1	16J 063	17J 063	684	414	410	410	708	414	ALIIXM A
	20631708		DBARC	2	17J 063	18J 063	708	414	410	410	732	414	ALIIXM A
	10631732		DBARC	1	18J 063	19J 063	732	414	410	410	756	414	ALIIXM A
	20631756		DBARC	2	19J 063	20J 063	756	414	410	410	780	414	ALIIXM A
	10631540		DBSYSCLK	1	10J 062	11J 062	540	418	414	414	564	418	ALIIXM A
	20631564		DBSYSCLK	2	11J 062	13J 062	564	418	414	414	612	418	ALIIXM A
	10652264		DBSYSCLK	1	13J 062	14J 067	264	502	486	0	288	482	ALIIXM A
	20652240		DBSYSCLK	2	14J 067	15J 067	240	502	498	498	264	502	ALIIXM A
	10652216		DBSYSCLK	1	15J 067	16J 067	216	502	498	498	240	502	ALIIXM A
	20652192		DBSYSCLK	2	16J 067	17J 067	192	502	498	498	216	502	ALIIXM A
	10652168		DBSYSCLK	1	17J 067	18J 067	168	502	498	498	192	502	ALIIXM A
	20652144		DBSYSCLK	2	18J 067	19J 067	144	502	498	498	168	502	ALIIXM A
	10652120		DBSYSCLK	1	19J 067	20J 067	120	502	498	498	144	502	ALIIXM A
	20652336		DCT1B	2	11J 105	07J 105	336	654	650	650	432	654	ALIIXM A
	10652336		DCT2B	1	11J 106	07J 106	336	658	654	654	432	658	ALIIXM A
	20652336		DCT4B	2	11J 107	07J 107	336	662	658	658	432	662	ALIIXM A
	10652336		DCT8B	1	11J 108	07J 108	336	666	662	662	432	666	ALIIXM A
	20652296		DDR-	2	11J 006	13J 006	296	502	498	498	344	502	ALIIXM A
	10622510		DHTAC*	1	10J 008	11J 023	510	532	0	536	570	556	ALIIXM A
	20652296		DHTAC*	2	11J 023	13J 023	296	570	566	566	344	570	ALIIXM A
	10652312		DNS	1	11J 075	12J 075	312	534	530	530	336	534	ALIIXM A
	20622506		DVTAC*	2	10J 007	11J 022	506	532	0	536	566	556	ALIIXM A
	10652296		DVTAC*	1	11J 022	13J 022	296	566	562	562	344	566	ALIIXM A
	20622518		DWTAC*	2	10J 010	11J 024	518	532	0	536	574	556	ALIIXM A
	1065229		DWTAC*	1	11J 024	13J 024	296	574	570	570	344	574	ALIIXM A

REFERENCE	MACH=	LIST=	NAME	Z	FROM	TO	AX	AY	VIAA	VIAB	BX	BY	SYSTEM	REV
	20622546		EMACT	2	09J 078	10J [illegible]	546	516	0	520	630	540	ALIIXM	A
	10652336		EMACT	1	10J 099	11J 09[illegible]	336	630	626	626	360	630	ALIIXM	A
	20652312		EMACT	2	11J 099	12J 099	312	630	626	626	336	630	ALIIXM	A
	10652264		EMACT	1	12J 099	14J 099	264	630	626	626	312	630	ALIIXM	A
	20652264		ESTOP	2	10J 076	14J 076	264	538	534	534	360	538	ALIIXM	A
	10622550		ETAC*	1	10J 018	11J 100	550	532	0	536	634	564	ALIIXM	A
	20652264		ETAC*	2	11J 100	14J 100	264	634	630	630	336	634	ALIIXM	A
	10652272		F1(0)	1	11J 030	14J 030	272	598	594	594	344	598	ALIIXM	A
	20652248		F1(0)	2	14J 030	15J 030	248	598	594	594	272	598	ALIIXM	A
	10652224		F1(0)	1	15J 030	16J 030	224	598	594	594	248	598	ALIIXM	A
	20652200		F1(0)	2	16J 030	17J 030	200	598	594	594	224	598	ALIIXM	A
	10652176		F1(0)	1	17J 030	18J 030	176	598	594	594	200	598	ALIIXM	A
	20652152		F1(0)	2	18J 030	19J 030	152	598	594	594	176	598	ALIIXM	A
	10652128		F1(0)	1	19J 030	20J 030	128	598	594	594	152	598	ALIIXM	A
	20652104		F1(0)	2	20J 030	21J 030	104	598	594	594	128	598	ALIIXM	A
	10652272		F1(1)	1	11J 031	14J 031	272	602	598	598	344	602	ALIIXM	A
	20652248		F1(1)	2	14J 031	15J 031	248	602	598	598	272	602	ALIIXM	A
	10652224		F1(1)	1	15J 031	16J 031	224	602	598	598	248	602	ALIIXM	A
	20652200		F1(1)	2	16J 031	17J 031	200	602	598	598	224	602	ALIIXM	A
	10652176		F1(1)	1	17J 031	18J 031	176	602	598	598	200	602	ALIIXM	A
	20652152		F1(1)	2	18J 031	19J 031	152	602	598	598	176	602	ALIIXM	A
	10652128		F1(1)	1	19J 031	20J 031	128	602	598	598	152	602	ALIIXM	A
	20652104		F1(1)	2	20J 031	21J 031	104	602	598	598	128	602	ALIIXM	A
	10652272		F1(2)	1	11J 032	14J 032	272	606	602	602	344	606	ALIIXM	A
	20652248		F1(2)	2	14J 032	15J 032	248	606	602	602	272	606	ALIIXM	A
	10652224		F1(2)	1	15J 032	16J 032	224	606	602	602	248	606	ALIIXM	A
	20652200		F1(2)	2	16J 032	17J 032	200	606	602	602	224	606	ALIIXM	A
	10652176		F1(2)	1	17J 032	18J 032	176	606	602	602	200	606	ALIIXM	A
	20652152		F1(2)	2	18J 032	19J 032	152	606	602	602	176	606	ALIIXM	A
	10652128		F1(2)	1	19J 032	20J 032	128	606	602	602	152	606	ALIIXM	A
	20652104		F1(2)	2	20J 032	21J 032	104	606	602	602	128	606	ALIIXM	A
	10652272		F1(3)	1	11J 033	14J 033	272	610	606	606	344	610	ALIIXM	A
	20652248		F1(3)	2	14J 033	15J 033	248	610	606	606	272	610	ALIIXM	A
	10652224		F1(3)	1	15J 033	16J 033	224	610	606	606	248	610	ALIIXM	A
	20652200		F1(3)	2	16J 033	17J 033	200	610	606	606	224	610	ALIIXM	A
	10652176		F1(3)	1	17J 033	18J 033	176	610	606	606	200	610	ALIIXM	A
	20652152		F1(3)	2	18J 033	19J 033	152	610	606	606	176	610	ALIIXM	A
	10652128		F1(3)	1	19J 033	20J 033	128	610	606	606	152	610	ALIIXM	A
	20652104		F1(3)	2	20J 033	21J 033	104	610	606	606	128	610	ALIIXM	A
	10652320		F2(0)	1	11J 036	12J 36	320	622	618	618	344	622	ALIIXM	A
	20652272		F2(0)	2	12J 036	14J 036	272	622	618	618	320	622	ALIIXM	A
	10652248		F2(0)	1	14J 036	15J 036	248	622	618	618	272	622	ALIIXM	A
	20652224		F2(0)	2	15J 036	16J 036	224	622	618	618	248	622	ALIIXM	A
	10652200		F2(0)	1	16J 036	17J 036	200	622	618	618	224	622	ALIIXM	A
	20652176		F2(0)	2	17J 036	18J 036	176	622	618	618	200	622	ALIIXM	A
	10652152		F2(0)	1	18J 036	19J 036	152	622	618	618	176	622	ALIIXM	A
	20652128		F2(0)	2	19J 036	20J 036	128	622	618	618	152	622	ALIIXM	A
	10652104		F2(0)	1	20J 036	21J 036	104	622	618	618	128	622	ALIIXM	A
	20652320		F2(1)	2	11J 037	12J 037	320	626	622	622	344	626	ALIIXM	A
	10652272		F2(1)	1	12J 037	14J 037	272	626	622	622	320	626	ALIIXM	A
	20652248		F2(1)	2	14J 037	15J 037	248	626	622	622	272	626	ALIIXM	A

REFERENCE	MACH#	LIST#	NAME	Z	FROM	TO	AX	AY	VIAA	VIAB	BX	BY	SYSTEM	REV
	10652224		F2(1)	1	15J 037	16J 037	224	626	622	622	248	626	ALIIXM	A
	20652200		F2(1)	2	16J 037	17J 037	200	626	622	622	224	626	ALIIXM	A
	10652176		F2(1)	1	17J 037	18J 037	176	626	622	622	200	626	ALIIXM	A
	20652152		F2(1)	2	18J 037	19J 037	152	626	622	622	176	626	ALIIXM	A
	10652128		F2(1)	1	19J 037	20J 037	128	626	622	622	152	626	ALIIXM	A
	20652104		F2(1)	2	20J 037	21J 037	104	626	622	622	128	626	ALIIXM	A
	10652320		F2(1)*	1	11J 029	12J 029	320	594	590	590	344	594	ALIIXM	A
	20652320		F2(2)	2	11J 038	12J 038	320	630	626	626	344	630	ALIIXM	A
	10652272		F2(2)	1	12J 038	14J 038	272	630	626	626	320	630	ALIIXM	A
	20652248		F2(2)	2	14J 038	15J 038	248	630	626	626	272	630	ALIIXM	A
	10652224		F2(2)	1	15J 038	16J 038	224	630	626	626	248	630	ALIIXM	A
	20652200		F2(2)	2	16J 038	17J 038	200	630	626	626	224	630	ALIIXM	A
	10652176		F2(2)	1	17J 038	18J 038	176	630	626	626	200	630	ALIIXM	A
	20652152		F2(2)	2	18J 038	19J 038	152	630	626	626	176	630	ALIIXM	A
	10652128		F2(2)	1	19J 038	20J 038	128	630	626	626	152	630	ALIIXM	A
	20652104		F2(2)	2	20J 038	21J 038	104	630	626	626	128	630	ALIIXM	A
	10652272		F2(3)	1	11J 039	14J 039	272	634	630	630	344	634	ALIIXM	A
	20652248		F2(3)	2	14J 039	15J 039	248	634	630	630	272	634	ALIIXM	A
	10652224		F2(3)	1	15J 039	16J 039	224	634	630	630	248	634	ALIIXM	A
	20652200		F2(3)	2	16J 039	17J 039	200	634	630	630	224	634	ALIIXM	A
	10652176		F2(3)	1	17J 039	18J 039	176	634	630	630	200	634	ALIIXM	A
	20652152		F2(3)	2	18J 039	19J 039	152	634	630	630	176	634	ALIIXM	A
	10652128		F2(3)	1	19J 039	20J 039	128	634	630	630	152	634	ALIIXM	A
	20652104		F2(3)	2	20J 039	21J 039	104	634	630	630	128	634	ALIIXM	A
	10653296		F2=10*	1	11J 051	13J 051	296	682	678	678	344	682	ALIIXM	A
	20653312		F2=11*	2	11J 116	12J 116	312	698	694	694	336	698	ALIIXM	A
	10653288		F2=11*	1	12J 116	13J 116	288	698	694	694	312	698	ALIIXM	A
	20631492		H-LATCH	2	08J 062	09J 062	492	418	414	414	516	418	ALIIXM	A
	10652392		INTIO	1	08J 031	09J 026	392	582	0	586	416	602	ALIIXM	A
	20652312		IR	2	11J 071	12J 071	312	518	514	514	336	518	ALIIXM	A
	10652320		IR(00)*	1	11J 010	12J 010	320	518	514	514	344	518	ALIIXM	A
	20652320		IR(01)*	2	11J 011	12J 011	320	522	518	518	344	522	ALIIXM	A
	10652320		IR(02)*	1	11J 012	12J 012	320	526	522	522	344	526	ALIIXM	A
	20652320		IR(03)*	2	11J 013	12J 013	320	530	526	526	344	530	ALIIXM	A
	10652320		IR(04)*	1	11J 014	12J 014	320	534	530	530	344	534	ALIIXM	A
	20652320		IR(05)*	2	11J 015	12J 015	320	538	534	534	344	538	ALIIXM	A
	10652320		IR(06)*	1	11J 016	12J 016	320	542	538	538	344	542	ALIIXM	A
	20652312		IR(07)*	2	11J 078	12J 078	312	546	542	542	336	546	ALIIXM	A
	10652320		IR(08)*	1	11J 018	12J 018	320	550	546	546	344	550	ALIIXM	A
	20652320		IR(09)*	2	11J 019	12J 019	320	554	550	550	344	554	ALIIXM	A

10653264	KDATA*	1	11J 111	14J 111	264	678	674	674	336	678	ALIIXM	A
20653096	KDATA*	2	14J 111	21J 111	96	678	674	674	264	678	ALIIXM	A
10622538	KSTAC*	1	10J 015	11J 028	538	532	0	536	590	556	ALIIXM	A
20652104	KSTAC*	2	11J 028	21J 028	104	590	586	586	344	590	ALIIXM	A
10653096	KSTAT*	1	11J 112	21J 112	96	682	678	678	336	682	ALIIXM	A
20652104	KSYSCLK	2	13J 007	21J 007	104	506	502	502	296	506	ALIIXM	A
10622526	KWDTAC*	1	10J 012	11J 025	526	532	0	536	578	556	ALIIXM	A
20652104	KWDTAC*	2	11J 025	21J 025	104	578	574	574	344	578	ALIIXM	A
10652320	LALUCO	1	11J 049	12J 049	320	674	670	670	344	674	ALIIXM	A
20652320	LCYB*	2	11J 048	12J 048	320	670	666	666	344	670	ALIIXM	A
10652320	LOADL	1	11J 007	12J 007	320	506	502	502	344	506	ALIIXM	A
20652312	LOADRX	2	11J 068	12J 068	312	506	502	502	336	506	ALIIXM	A
10652312	LOADT*	1	11J 069	12J 069	312	510	506	506	336	510	ALIIXM	A
20652320	LSH1*	2	11J 046	12J 046	320	662	658	658	344	662	ALIIXM	A
10622522	MAR-	1	09J 038	11J 072	522	564	512	0	630	508	ALIIXM	A
20652336	MAR-	2	11J 072	07J 072	336	522	518	518	432	522	ALIIXM	A
10652336	MD-*	1	07J 073	11J 073	336	526	522	522	432	526	ALIIXM	A
20622482	ME-	2	07J 062	09J 024	482	468	0	472	574	508	ALIIXM	A
10652456	M1ARC	1	05J 075	06J 075	456	534	530	530	480	534	ALIIXM	A
20652432	M1ARC	2	06J 075	07J 075	432	534	530	530	456	534	ALIIXM	A
10652384	M1ARC	1	07J 075	09J 075	384	534	530	530	432	534	ALIIXM	A
20652288	M1ARC	2	09J 075	13J 071	288	518	0	522	384	534	ALIIXM	A
10652416	M1SYSCLK	1	07J 034	08J 034	416	614	610	610	440	614	ALIIXM	A
20652392	M1SYSCLK	2	08J 034	09J 037	392	626	618	0	416	614	ALIIXM	A
10622510	M1SYSCLK	1	09J 037	13J 069	510	612	512	0	626	508	ALIIXM	A
20622486	MRTAC*	2	09J 063	11J 109	486	516	0	520	670	564	ALIIXM	A
10622502	NERROR	1	08J 067	09J 116	502	492	0	496	698	516	ALIIXM	A
20652392	NERRSEL	2	08J 028	09J 028	392	590	586	586	416	590	ALIIXM	A
10652264	NEXT(05)*	1	10J 116	14J 105	264	654	0	658	360	698	ALIIXM	A
20652240	NEXT(05)*	2	14J 105	15J 105	240	654	650	650	264	654	ALIIXM	A
10652216	NEXT(05)*	1	15J 105	16J 105	216	654	650	650	240	654	ALIIXM	A
20652192	NEXT(05)*	2	16J 105	17J 105	192	654	650	650	216	654	ALIIXM	A
10652168	NEXT(05)*	1	17J 105	18J 105	168	654	650	650	192	654	ALIIXM	A
20652144	NEXT(05)*	2	18J 105	19J 105	144	654	650	650	168	654	ALIIXM	A
10652120	NEXT(05)*	1	19J 105	20J 105	120	654	650	650	144	654	ALIIXM	A
20652096	NEXT(05)*	2	20J 105	21J 105	96	654	650	650	120	654	ALIIXM	A
10652264	NEXT(06)*	1	10J 117	14J 106	264	658	0	662	360	702	ALIIXM	A
20652240	NEXT(06)*	2	14J 106	15J 106	240	658	654	654	264	658	ALIIXM	A
10652216	NEXT(06)*	1	15J 106	16J 106	216	658	654	654	240	658	ALIIXM	A

REFERENCE	MACH=	LIST=	NAME	Z	FROM	TO	AX	AY	VIAA	VIAB	BX	BY	SYSTEM REV
20652192			NEXT(06)*	2	16J 106	17J [illegible]	192	658	654	654	216	658	ALIIXM A
10652168			NEXT(06)*	1	17J 106	18J [illegible]	168	658	654	654	192	658	ALIIXM A
20652144			NEXT(06)*	2	18J 106	19J 106	144	658	654	654	168	658	ALIIXM A
10652120			NEXT(06)*	1	19J 106	20J 106	120	658	654	654	144	658	ALIIXM A
20652096			NEXT(06)*	2	20J 106	21J 106	96	658	654	654	120	658	ALIIXM A
10652264			NEXT(07)*	1	10J 118	14J 107	264	662	0	666	360	706	ALIIXM A
20652240			NEXT(07)*	2	14J 107	15J 107	240	662	658	658	264	662	ALIIXM A
10652216			NEXT(07)*	1	15J 107	16J 107	216	662	658	658	240	662	ALIIXM A
20652192			NEXT(07)*	2	16J 107	17J 107	192	662	658	658	216	662	ALIIXM A
10652168			NEXT(07)*	1	17J 107	18J 107	168	662	658	658	192	662	ALIIXM A
20652144			NEXT(07)*	2	18J 107	19J 107	144	662	658	658	168	662	ALIIXM A
10652120			NEXT(07)*	1	19J 107	20J 107	120	662	658	658	144	662	ALIIXM A
20652096			NEXT(07)*	2	20J 107	21J 107	96	662	658	658	120	662	ALIIXM A
10652264			NEXT(08)*	1	10J 119	14J 108	264	666	0	670	360	710	ALIIXM A
20652240			NEXT(08)*	2	14J 108	15J 108	240	666	662	662	264	666	ALIIXM A
1065221			NEXT(08)*	1	15J 108	16J 108	216	666	662	662	240	666	ALIIXM A
20652192			NEXT(08)*	2	16J 108	17J 108	192	666	662	662	216	666	ALIIXM A
10652168			NEXT(08)*	1	17J 108	18J 108	168	666	662	662	192	666	ALIIXM A
20652144			NEXT(08)*	2	18J 108	19J 108	144	666	662	662	168	666	ALIIXM A
10652120			NEXT(08)*	1	19J 108	20J 108	120	666	662	662	144	666	ALIIXM A
20652096			NEXT(08)*	2	20J 108	21J 108	96	666	662	662	120	666	ALIIXM A
10652288			NEXT(09)*	1	10J 120	13J 109	288	670	0	674	360	714	ALIIXM A
20652264			NEXT(09)*	2	13J 109	14J 109	264	670	666	666	288	670	ALIIXM A
10652240			NEXT(09)*	1	14J 109	15J 109	240	670	666	666	264	670	ALIIXM A
20652216			NEXT(09)*	2	15J 109	16J 109	216	670	666	666	240	670	ALIIXM A
10652192			NEXT(09)*	1	16J 109	17J 109	192	670	666	666	216	670	ALIIXM A
20652168			NEXT(09)*	2	17J 109	18J 109	168	670	666	666	192	670	ALIIXM A
10652144			NEXT(09)*	1	18J 109	19J 109	144	670	666	666	168	670	ALIIXM A
20652120			NEXT(09)*	2	19J 109	20J 109	120	670	666	666	144	670	ALIIXM A
10652096			NEXT(09)*	1	20J 109	21J 109	96	670	666	666	120	670	ALIIXM A
20652392			NFETCH	2	08J 063	09J 006	392	502	490	0	408	486	ALIIXM A
10622538			NRSTERR	1	08J 114	09J 076	538	516	496	0	690	492	ALIIXM A
20631412			NSTART	2	05J 001	06J 001	412	418	414	414	436	418	ALIIXM A
10631436			NSTART	1	06J 001	07J 001	436	418	414	414	460	418	ALIIXM A
20631460			NSTART	2	07J 001	08J 001	460	418	414	414	484	418	ALIIXM A
10622482			NSTART	1	08J 001	09J 042	482	484	0	488	646	508	ALIIXM A
20653392			NTESTMODE	2	08J 061	09J 061	392	722	718	718	416	722	ALIIXM A
10652392			ODD	1	08J 030	09J 030	392	598	594	594	416	598	ALIIXM A
20652272			OKOTORUN	2	10J 001	14J 011	272	522	486	0	368	482	ALIIXM A
10652248			OKOTORUN	1	14J 011	15J 011	248	522	518	518	272	522	ALIIXM A
20652224			OKOTORUN	2	15J 011	16J 011	224	522	518	518	248	522	ALIIXM A
10652200			OKOTORUN	1	16J 011	17J 011	200	522	518	518	224	522	ALIIXM A
20652176			OKOTORUN	2	17J 011	18J 011	176	522	518	518	200	522	ALIIXM A
10652152			OKOTORUN	1	18J 011	19J 011	152	522	518	518	176	522	ALIIXM A
20652128			OKOTORUN	2	19J 011	20J 011	128	522	518	518	152	522	ALIIXM A
10652104			OKOTORUN	1	20J 011	21J 011	104	522	518	518	128	522	ALIIXM A
20622542			PARTAC*	2	09J 098	10J 016	542	532	520	0	626	516	ALIIXM A
10622542			PARTAC*	1	10J 016	11J 061	542	532	0	536	722	556	ALIIXM A

REFER E	MACH=	LIST=	NAME	Z	FROM	TO	AX	AY	VIAA	VIAB	BX	BY	SYSTEM REV
	20653392		POK	2	08J 115	09J	392	694	690	690	408	694	ALIIXM A
	10652552		RAS(0)	1	01J 071	02J 071	552	518	514	514	576	518	ALIIXM A
	20652528		RAS(0)	2	02J 071	03J 071	528	518	514	514	552	518	ALIIXM A
	10652504		RAS(0)	1	03J 071	04J 071	504	518	514	514	528	518	ALIIXM A
	20621518		RAS(0)	2	04J 071	09J 044	518	396	0	400	654	508	ALIIXM A
	10652552		RAS(1)	1	01J 079	02J 079	552	550	546	546	576	550	ALIIXM A
	20652528		RAS(1)	2	02J 079	03J 079	528	550	546	546	552	550	ALIIXM A
	10652504		RAS(1)	1	03J 079	04J 079	504	550	546	546	528	550	ALIIXM A
	20652392		RAS(1)	2	04J 079	09J 046	392	662	554	0	504	550	ALIIXM A
	10652552		RAS(2)	1	01J 090	02J 090	552	594	590	590	576	594	ALIIXM A
	20652528		RAS(2)	2	02J 090	03J 090	528	594	590	590	552	594	ALIIXM A
	10652504		RAS(2)	1	03J 090	04J 090	504	594	590	590	528	594	ALIIXM A
	20652392		RAS(2)	2	04J 090	09J 047	392	666	598	0	504	594	ALIIXM A
	1065255.		RAS(3)	1	01J 086	02J 086	552	578	574	574	576	578	ALIIXM A
	20652528		RAS(3)	2	02J 086	03J 086	528	578	574	574	552	578	ALIIXM A
	10652504		RAS(3)	1	03J 086	04J 086	504	578	574	574	528	578	ALIIXM A
	20652392		RAS(3)	2	04J 086	09J 048	392	670	582	0	504	578	ALIIXM A
	10652552		RAS(4)	1	01J 102	02J 102	552	642	638	638	576	642	ALIIXM A
	20652528		RAS(4)	2	02J 102	03J 102	528	642	638	638	552	642	ALIIXM A
	10652504		RAS(4)	1	03J 102	04J 102	504	642	638	638	528	642	ALIIXM A
	20652392		RAS(4)	2	04J 102	09J 049	392	674	646	0	504	642	ALIIXM A
	10652552		RAS(5)	1	01J 106	02J 106	552	658	654	654	576	658	ALIIXM A
	20652528		RAS(5)	2	02J 106	03J 106	528	658	654	654	552	658	ALIIXM A
	10652504		RAS(5)	1	03J 106	04J 106	504	658	654	654	528	658	ALIIXM A
	20652392		RAS(5)	2	04J 106	09J 050	392	678	662	0	504	658	ALIIXM A
	10653552		RAS(6)	1	01J 111	02J 111	552	678	674	674	576	678	ALIIXM A
	20653528		RAS(6)	2	02J 111	03J 111	528	678	674	674	552	678	ALIIXM A
	10653504		RAS(6)	1	03J 111	04J 111	504	678	674	674	528	678	ALIIXM A
	20653392		RAS(6)	2	04J 111	09J 051	392	682	674	674	504	678	ALIIXM A
	10652552		RAS(7)	1	01J 099	02J 099	552	630	626	626	576	630	ALIIXM A
	20652528		RAS(7)	2	02J 099	03J 099	528	630	626	626	552	630	ALIIXM A
	10652504		RAS(7)	1	03J 099	04J 099	504	630	626	626	528	630	ALIIXM A
	20652392		RAS(7)	2	04J 099	09J 052	392	686	634	0	504	630	ALIIXM A
	10653336		READMOUSE	1	09J 117	11J 117	336	702	698	698	384	702	ALIIXM A
	20631460		RESET	2	07J 002	09J 002	460	414	410	410	508	414	ALIIXM A
	10631508		RESET	1	09J 002	10J 002	508	414	410	410	532	414	ALIIXM A
	20631532		RESET	2	10J 002	11J 002	532	414	410	410	556	414	ALIIXM A
	10631556		RESET	1	11J 002	14J 002	556	414	410	410	628	414	ALIIXM A
	20631628		RESET	2	14J 002	15J 002	628	414	410	410	652	414	ALIIXM A
	10631652		RESET	1	15J 002	16J 002	652	414	410	410	676	414	ALIIXM A
	20631676		RESET	2	16J 002	17J 002	676	414	410	410	700	414	ALIIXM A
	10631700		RESET	1	17J 002	18J 002	700	414	410	410	724	414	ALIIXM A
	20631724		RESET	2	18J 002	19J 002	724	414	410	410	748	414	ALIIXM A
	10631748		RESET	1	19J 002	20J 002	748	414	410	410	772	414	ALIIXM A
	20631772		RESET	2	20J 002	21J 002	772	414	410	410	796	414	ALIIXM A
	10652488		RM00*	1	01J 075	05J 026	488	582	538	0	576	534	ALIIXM A
	20652464		RM00*	2	05J 026	06J 026	464	582	578	578	488	582	ALIIXM A
	10652440		RM00*	1	06J 026	07J 026	440	582	578	578	464	582	ALIIXM A

REFERENCE	MACH#	LIST#	NAME	Z	FROM		AX	AY	VIAA	VIAB	BX	BY	SYSTEM	REV
	20652416		RM00*	2	07J 026	08J 026	416	582	578	578	440	582	ALIIXM	A
	10652488		RM01*	1	02J 075	05J 025	488	578	538	0	552	534	ALIIXM	A
	20652464		RM01*	2	05J 025	06J 025	464	578	574	574	488	578	ALIIXM	A
	10652440		RM01*	1	06J 025	07J 025	440	578	574	574	464	578	ALIIXM	A
	20652416		RM01*	2	07J 025	08J 025	416	578	574	574	440	578	ALIIXM	A
	10652488		RM02*	1	03J 075	05J 024	488	574	538	0	528	534	ALIIXM	A
	20652464		RM02*	2	05J 024	06J 024	464	574	570	570	488	574	ALIIXM	A
	10652440		RM02*	1	06J 024	07J 024	440	574	570	570	464	574	ALIIXM	A
	20652416		RM02*	2	07J 024	08J 024	416	574	570	570	440	574	ALIIXM	A
	10621534		RM03*	1	04J 075	05J 023	534	396	0	400	570	412	ALIIXM	A
	20652464		RM03*	2	05J 023	06J 023	464	570	566	566	488	570	ALIIXM	A
	10652440		RM03*	1	06J 023	07J 023	440	570	566	566	464	570	ALIIXM	A
	20652416		RM03*	2	07J 023	08J 023	416	570	566	566	440	570	ALIIXM	A
	10652488		RM04*	1	01J 073	05J 022	488	566	530	0	576	526	ALIIXM	A
	20652464		RM04*	2	05J 022	06J 022	464	566	562	562	488	566	ALIIXM	A
	10652440		RM04*	1	06J 022	07J 022	440	566	562	562	464	566	ALIIXM	A
	20652416		RM04*	2	07J 022	08J 022	416	566	562	562	440	566	ALIIXM	A
	10652488		RM05*	1	02J 073	05J 021	488	562	530	0	552	526	ALIIXM	A
	20652464		RM05*	2	05J 021	06J 021	464	562	558	558	488	562	ALIIXM	A
	10652440		RM05*	1	06J 021	07J 021	440	562	558	558	464	562	ALIIXM	A
	20652416		RM05*	2	07J 021	08J 021	416	562	558	558	440	562	ALIIXM	A
	10652488		RM06*	1	03J 073	05J 020	488	558	530	0	528	526	ALIIXM	A
	20652464		RM06*	2	05J 020	06J 020	464	558	554	554	488	558	ALIIXM	A
	10652440		RM06*	1	06J 020	07J 020	440	558	554	554	464	558	ALIIXM	A
	20652416		RM06*	2	07J 020	08J 020	416	558	554	554	440	558	ALIIXM	A
	10621526		RM07*	1	04J 073	05J 019	526	396	0	400	554	412	ALIIXM	A
	20652464		RM07*	2	05J 019	06J 019	464	554	550	550	488	554	ALIIXM	A
	10652440		RM07*	1	06J 019	07J 019	440	554	550	550	464	554	ALIIXM	A
	20652416		RM07*	2	07J 019	08J 019	416	554	550	550	440	554	ALIIXM	A
	10652488		RM08*	1	01J 084	05J 018	488	550	0	554	576	570	ALIIXM	A
	20652464		RM08*	2	05J 018	06J 018	464	550	546	546	488	550	ALIIXM	A
	10652440		RM08*	1	06J 018	07J 018	440	550	546	546	464	550	ALIIXM	A
	20652416		RM08*	2	07J 018	08J 018	416	550	546	546	440	550	ALIIXM	A
	10652488		RM09*	1	02J 084	05J 016	488	542	0	546	552	570	ALIIXM	A
	20652464		RM09*	2	05J 016	06J 016	464	542	538	538	488	542	ALIIXM	A
	10652440		RM09*	1	06J 016	07J 016	440	542	538	538	464	542	ALIIXM	A
	20652416		RM09*	2	07J 016	08J 016	416	542	538	538	440	542	ALIIXM	A
	10652488		RM10*	1	03J 084	05J 015	488	538	0	542	528	570	ALIIXM	A
	20652464		RM10*	2	05J 015	06J 015	464	538	534	534	488	538	ALIIXM	A
	10652440		RM10*	1	06J 015	07J 015	440	538	534	534	464	538	ALIIXM	A
	20652416		RM10*	2	07J 015	08J 015	416	538	534	534	440	538	ALIIXM	A
	10621534		RM11*	1	04J 084	05J 014	534	412	400	0	570	396	ALIIXM	A
	20652464		RM11*	2	05J 014	06J 014	464	534	530	530	488	534	ALIIXM	A
	10652440		RM11*	1	06J 014	07J 014	440	534	530	530	464	534	ALIIXM	A
	20652416		RM11*	2	07J 014	08J 014	416	534	530	530	440	534	ALIIXM	A
	10652488		RM12*	1	01J 081	05J 013	488	530	0	534	576	558	ALIIXM	A
	20652464		RM12*	2	05J 013	06J 013	464	530	526	526	488	530	ALIIXM	A

REFERENCE	MACH#	LIST#	NAME	Z	FROM	TO	AX	AY	VIAA	VIAB	BX	BY	SYSTEM	REV
	10652440		RM12*	1	06J 013	07J [illegible]	440	530	526	526	464	530	ALIIXM	A
	20652416		RM12*	2	07J 013	08J [illegible]	416	530	526	526	440	530	ALIIXM	A
	10652488		RM13*	1	02J 081	05J 012	488	526	0	530	552	558	ALIIXM	A
	20652464		RM13*	2	05J 012	06J 012	464	526	522	522	488	526	ALIIXM	A
	10652440		RM13*	1	06J 012	07J 012	440	526	522	522	464	526	ALIIXM	A
	20652416		RM13*	2	07J 012	08J 012	416	526	522	522	440	526	ALIIXM	A
	10652488		RM14*	1	03J 081	05J 011	488	522	0	526	528	558	ALIIXM	A
	20652464		RM14*	2	05J 011	06J 011	464	522	518	518	488	522	ALIIXM	A
	10652440		RM14*	1	06J 011	07J 011	440	522	518	518	464	522	ALIIXM	A
	20652416		RM14*	2	07J 011	08J 011	416	522	518	518	440	522	ALIIXM	A
	10621518		RM15*	1	04J 081	05J 010	518	412	400	0	558	396	ALIIXM	A
	20652464		RM15*	2	05J 010	06J 010	464	518	514	514	488	518	ALIIXM	A
	10652440		RM15*	1	06J 010	07J 010	440	518	514	514	464	518	ALIIXM	A
	20652416		RM15*	2	07J 010	08J 010	416	518	514	514	440	518	ALIIXM	A
	10652416		RM16*	1	01J 094	08J 008	416	510	0	514	576	610	ALIIXM	A
	20652416		RM17*	2	02J 094	08J 007	416	506	0	510	552	610	ALIIXM	A
	10652416		RM18*	1	03J 094	08J 006	416	502	0	506	528	610	ALIIXM	A
	20621486		RM19*	2	04J 094	08J 002	486	484	400	0	610	396	ALIIXM	A
	10652408		RM20*	1	01J 092	08J [illegible]	408	550	0	554	576	602	ALIIXM	A
	20652408		RM21*	2	02J 092	08J 078	408	546	0	550	552	602	ALIIXM	A
	10652408		RM22*	1	03J 092	08J 077	408	542	0	546	528	602	ALIIXM	A
	20652408		RM23*	2	04J 092	08J 076	408	538	0	542	504	602	ALIIXM	A
	10652408		RM24*	1	01J 097	08J 075	408	534	0	538	576	622	ALIIXM	A
	20652408		RM25*	2	02J 097	08J 074	408	530	0	534	552	622	ALIIXM	A
	10652408		RM26*	1	03J 097	08J 073	408	526	0	530	528	622	ALIIXM	A
	20621522		RM27*	2	04J 097	08J 072	522	492	400	0	622	396	ALIIXM	A
	10652408		RM28*	1	01J 103	08J 071	408	518	0	522	576	646	ALIIXM	A
	20652408		RM29*	2	02J 103	08J 070	408	514	0	518	552	646	ALIIXM	A
	10621510		RM30*	1	03J 103	08J 069	510	492	376	0	646	372	ALIIXM	A
	20621506		RM31*	2	04J 103	08J 068	506	492	400	0	646	396	ALIIXM	A
	10652408		RM32*	1	01J 109	08J 116	408	698	674	0	576	670	ALIIXM	A
	20652408		RM33*	2	02J 109	08J 117	408	702	674	0	552	670	ALIIXM	A
	10652408		RM34*	1	03J 109	08J 118	408	706	674	0	528	670	ALIIXM	A
	20652408		RM35*	2	04J 109	08J 119	408	710	674	0	504	670	ALIIXM	A
	10653408		RM36*	1	01J 113	08J 120	408	714	690	0	576	686	ALIIXM	A

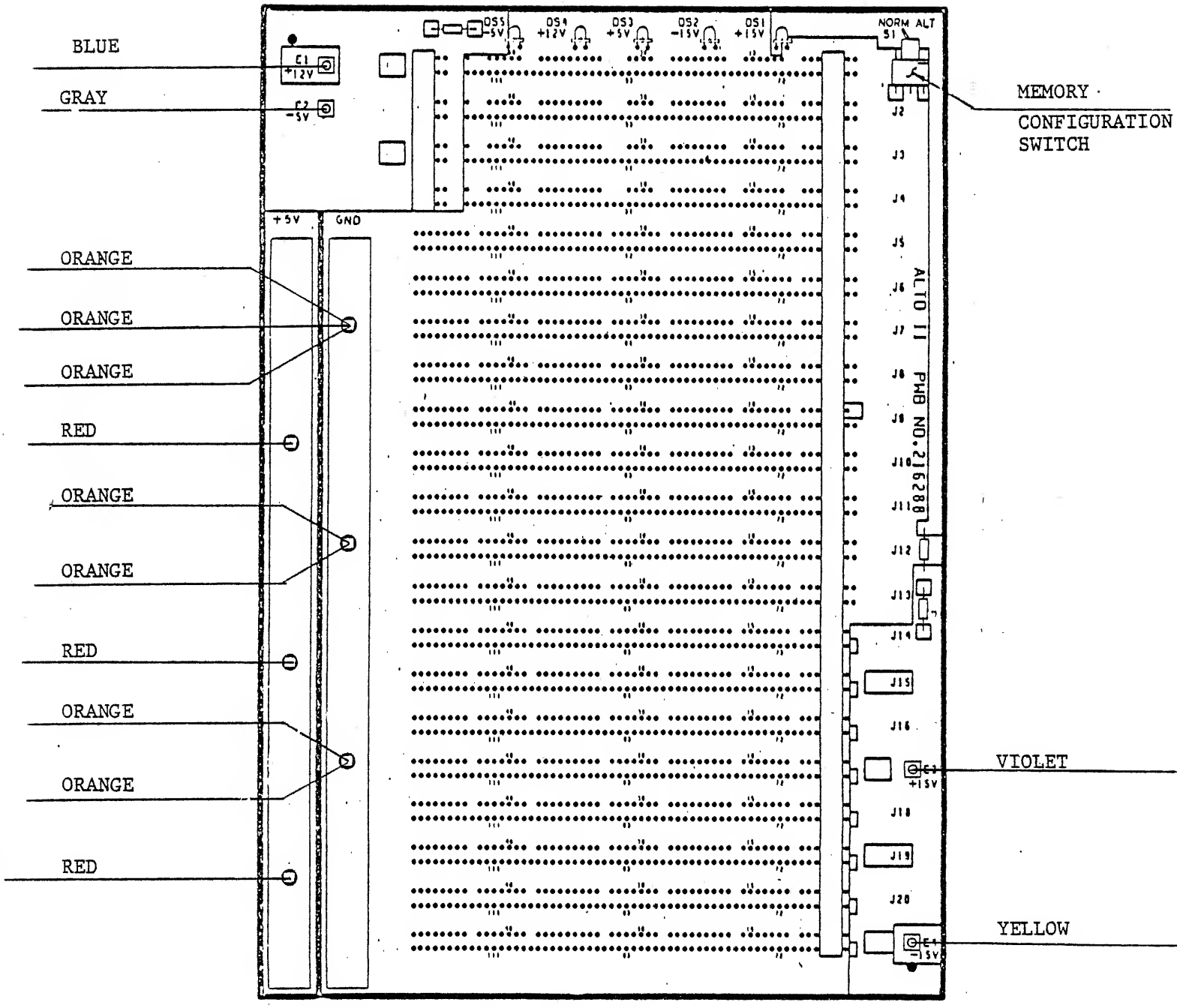
REFERENCE	MACH#	LIST#	NAME	Z	FROM	TO	AX	AY	VIAA	VIAB	BX	BY	SYSTEM	REV
	20653408		RM37*	2	02J 113	08J 1	408	718	690	0	552	686	ALIIXM	A
	10653408		RM38*	1	03J 113	08J 122	408	722	690	0	528	686	ALIIXM	A
	20622602		RSELO	2	09J 031	11J 054	602	508	0	512	694	556	ALIIXM	A
	10653320		RSELO	1	11J 054	12J 054	320	694	690	690	344	694	ALIIXM	A
	20622606		RSEL1	2	09J 032	11J 055	606	508	0	512	698	556	ALIIXM	A
	10653320		RSEL1	1	11J 055	12J 055	320	698	694	694	344	698	ALIIXM	A
	20622610		RSEL2	2	09J 033	11J 056	610	508	0	512	702	556	ALIIXM	A
	10653320		RSEL2	1	11J 056	12J 056	320	702	698	698	344	702	ALIIXM	A
	20622614		RSEL3	2	09J 034	11J 057	614	508	0	512	706	556	ALIIXM	A
	10653320		RSEL3	1	11J 057	12J 057	320	706	702	702	344	706	ALIIXM	A
	20622622		RSEL4	2	09J 036	11J 059	622	508	0	512	714	556	ALIIXM	A
	10653320		RSEL4	1	11J 059	12J 059	320	714	710	710	344	714	ALIIXM	A
	20652320		RSH1*	2	11J 047	12J 047	320	666	662	662	344	666	ALIIXM	A
	10652096		RMRCLR*	1	10J 072	21J 073	96	526	518	518	360	522	ALIIXM	A
	20652336		SELR37	2	09J 013	11J 074	336	530	526	526	392	530	ALIIXM	A
	10653320		SHOO	1	11J 050	12J 050	320	678	674	674	344	678	ALIIXM	A
	20652320		SHZERO	2	11J 026	12J 026	320	582	578	578	344	582	ALIIXM	A
	10652248		SIO*	1	14J 041	15J 041	248	642	638	638	272	642	ALIIXM	A
	20652224		SIO*	2	15J 041	16J 041	224	642	638	638	248	642	ALIIXM	A
	10652200		SIO*	1	16J 041	17J 041	200	642	638	638	224	642	ALIIXM	A
	20652176		SIO*	2	17J 041	18J 041	176	642	638	638	200	642	ALIIXM	A
	10652152		SIO*	1	18J 041	19J 041	152	642	638	638	176	642	ALIIXM	A
	20652128		SIO*	2	19J 041	20J 041	128	642	638	638	152	642	ALIIXM	A
	10652384		SRESET*	1	07J 006	09J 079	384	550	506	0	440	502	ALIIXM	A
	20652304		SRESET*	2	09J 079	10J 019	368	554	546	546	384	550	ALIIXM	A
	10622482		SRESET*	1	10J 019	11J 001	482	556	536	0	554	532	ALIIXM	A
	20652264		SRESET*	2	11J 001	14J 070	264	514	486	0	344	482	ALIIXM	A
	10652096		SRESET*	1	14J 070	21J 070	96	514	510	510	264	514	ALIIXM	A
	20652296		STOP*	2	09J 074	13J 001	296	482	0	486	384	530	ALIIXM	A
	10652296		STOPCLK	1	10J 020	13J 020	296	558	554	554	368	558	ALIIXM	A
	20652392		STORE*	2	08J 029	09J 029	392	594	590	590	416	594	ALIIXM	A
	10622530		STORE*	1	09J 029	07J 074	530	468	0	472	594	508	ALIIXM	A
	20622506		SWAKMRT	2	09J 039	13J 068	506	612	512	0	634	508	ALIIXM	A
	10652264		SWAKMRT	1	13J 068	14J 068	264	506	502	502	288	506	ALIIXM	A
	20652248		TASKA*	2	10J 013	15J 013	248	530	526	526	368	530	ALIIXM	A
	10652224		TASKA*	1	15J 013	16J 013	224	530	526	526	248	530	ALIIXM	A
	20652200		TASKA*	2	16J 013	17J 013	200	530	526	526	224	530	ALIIXM	A
	10652176		TASKA*	1	17J 013	18J 013	176	530	526	526	200	530	ALIIXM	A
	20652152		TASKA*	2	18J 013	19J 013	152	530	526	526	176	530	ALIIXM	A
	10652128		TASKA*	1	19J 013	20J 013	128	530	526	526	152	530	ALIIXM	A

REFERENCE	MACH=	LIST=	NAME	Z	FROM	TO	AX	AY	VIAA	VIAB	BX	BY	SYSTEM	REV
	20653288		WAKECURT*	2	11J 115	13J	288	694	690	690	336	694	ALIIXM	A
	10652288		WAKEDHT*	1	11J 077	13J 077	288	542	538	538	336	542	ALIIXM	A
	20652288		WAKEDVT*	2	11J 076	13J 076	288	538	534	534	336	538	ALIIXM	A
	10652296		WAKEDWT*	1	11J 021	13J 021	296	562	558	558	344	562	ALIIXM	A
	20652264		WAKEET*	2	11J 103	14J 103	264	646	642	642	336	646	ALIIXM	A
	10652104		WAKEKST*	1	11J 070	21J 008	104	510	506	506	336	514	ALIIXM	A
	20652096		WAKEKWDT*	2	11J 079	21J 079	96	550	546	546	336	550	ALIIXM	A
	10652336		WAKEMRT*	1	09J 010	11J 067	336	502	0	506	392	518	ALIIXM	A
	20653336		WAKEPART*	2	09J 118	11J 118	336	706	702	702	384	706	ALIIXM	A
	10652264		WAKE6*	1	11J 104	14J 104	264	650	646	646	336	650	ALIIXM	A
	20621522		WM(00)*	2	01J 072	05J 036	522	324	0	328	622	412	ALIIXM	A
	10652464		WM(00)*	1	05J 036	06J 036	464	622	618	618	488	622	ALIIXM	A
	20652440		WM(00)*	2	06J 036	07J 036	440	622	618	618	464	622	ALIIXM	A
	10652416		WM(00)*	1	07J 036	08J 036	416	622	618	618	440	622	ALIIXM	A
	20621522		WM(01)*	2	02J 072	05J 097	522	348	0	352	622	420	ALIIXM	A
	10652456		WM(01)*	1	05J 097	06J 097	456	622	618	618	480	622	ALIIXM	A
	20652432		WM(01)*	2	06J 097	07J 097	432	622	618	618	456	622	ALIIXM	A
	10652408		WM(01)*	1	07J 097	08J 097	408	622	618	618	432	622	ALIIXM	A
	20621522		WM(02)*	2	03J 072	05J 037	522	372	0	376	626	412	ALIIXM	A
	10652464		WM(02)*	1	05J 037	06J 037	464	626	622	622	488	626	ALIIXM	A
	20652440		WM(02)*	2	06J 037	07J 037	440	626	622	622	464	626	ALIIXM	A
	10652416		WM(02)*	1	07J 037	08J 037	416	626	622	622	440	626	ALIIXM	A
	20621522		WM(03)*	2	04J 072	05J 098	522	396	0	400	626	420	ALIIXM	A
	10652456		WM(03)*	1	05J 098	06J 098	456	626	622	622	480	626	ALIIXM	A
	20652432		WM(03)*	2	06J 098	07J 098	432	626	622	622	456	626	ALIIXM	A
	10652408		WM(03)*	1	07J 098	08J 098	408	626	622	622	432	626	ALIIXM	A
	20621530		WM(04)*	2	01J 074	05J 038	530	324	0	328	630	412	ALIIXM	A
	10652464		WM(04)*	1	05J 038	06J 038	464	630	626	626	488	630	ALIIXM	A
	20652440		WM(04)*	2	06J 038	07J 038	440	630	626	626	464	630	ALIIXM	A
	10652416		WM(04)*	1	07J 038	08J 038	416	630	626	626	440	630	ALIIXM	A
	20621530		WM(05)*	2	02J 074	05J 099	530	348	0	352	630	420	ALIIXM	A
	10652456		WM(05)*	1	05J 099	06J 099	456	630	626	626	480	630	ALIIXM	A
	20652432		WM(05)*	2	06J 099	07J 099	432	630	626	626	456	630	ALIIXM	A
	10652408		WM(05)*	1	07J 099	08J 099	408	630	626	626	432	630	ALIIXM	A
	20621530		WM(06)*	2	03J 074	05J 039	530	372	0	376	634	412	ALIIXM	A
	10652464		WM(06)*	1	05J 039	06J 039	464	634	630	630	488	634	ALIIXM	A
	20652440		WM(06)*	2	06J 039	07J 039	440	634	630	630	464	634	ALIIXM	A
	10652416		WM(06)*	1	07J 039	08J 039	416	634	630	630	440	634	ALIIXM	A
	20621530		WM(07)*	2	04J 074	05J 100	530	396	0	400	634	420	ALIIXM	A
	10652456		WM(07)*	1	05J 100	06J 100	456	634	630	630	480	634	ALIIXM	A
	20652432		WM(07)*	2	06J 100	07J 100	432	634	630	630	456	634	ALIIXM	A
	10652408		WM(07)*	1	07J 100	08J 100	408	634	630	630	432	634	ALIIXM	A

REFERENCE	MACH=	LIST=	NAME	Z	FROM	TO	AX	AY	VIAA	VIAB	BX	BY	SYSTEM	REV
	20652488		WM(08)*	2	01J 080	05J 039	488	638	558	0	576	554	ALIIXM	A
	10652464		WM(08)*	1	05J 040	06J 040	464	638	634	634	488	638	ALIIXM	A
	20652440		WM(08)*	2	06J 040	07J 040	440	638	634	634	464	638	ALIIXM	A
	10652416		WM(08)*	1	07J 040	08J 040	416	638	634	634	440	638	ALIIXM	A
	20621554		WM(09)*	2	02J 080	05J 101	554	348	0	352	638	420	ALIIXM	A
	10652456		WM(09)*	1	05J 101	06J 101	456	638	634	634	480	638	ALIIXM	A
	20652432		WM(09)*	2	06J 101	07J 101	432	638	634	634	456	638	ALIIXM	A
	10652408		WM(09)*	1	07J 101	08J 101	408	638	634	634	432	638	ALIIXM	A
	20621554		WM(10)*	2	03J 080	05J 041	554	372	0	376	642	412	ALIIXM	A
	10652464		WM(10)*	1	05J 041	06J 041	464	642	638	638	488	642	ALIIXM	A
	20652440		WM(10)*	2	06J 041	07J 041	440	642	638	638	464	642	ALIIXM	A
	10652416		WM(10)*	1	07J 041	08J 041	416	642	638	638	440	642	ALIIXM	A
	20621554		WM(11)*	2	04J 080	05J 102	554	396	0	400	642	420	ALIIXM	A
	10652456		WM(11)*	1	05J 102	06J 102	456	642	638	638	480	642	ALIIXM	A
	20652432		WM(11)*	2	06J 102	07J 102	432	642	638	638	456	642	ALIIXM	A
	10652408		WM(11)*	1	07J 102	08J 102	408	642	638	638	432	642	ALIIXM	A
	20652488		WM12*	2	01J 083	05J 042	488	646	570	0	576	566	ALIIXM	A
	10652464		WM12*	1	05J 042	06J 042	464	646	642	642	488	646	ALIIXM	A
	20652440		WM12*	2	06J 042	07J 042	440	646	642	642	464	646	ALIIXM	A
	10652416		WM12*	1	07J 042	08J 042	416	646	642	642	440	646	ALIIXM	A
	20621566		WM13*	2	02J 083	05J 103	566	348	0	352	646	420	ALIIXM	A
	10652456		WM13*	1	05J 103	06J 103	456	646	642	642	480	646	ALIIXM	A
	20652432		WM13*	2	06J 103	07J 103	432	646	642	642	456	646	ALIIXM	A
	10652408		WM13*	1	07J 103	08J 103	408	646	642	642	432	646	ALIIXM	A
	20621566		WM14*	2	03J 083	05J 043	566	372	0	376	650	412	ALIIXM	A
	10652464		WM14*	1	05J 043	06J 043	464	650	646	646	488	650	ALIIXM	A
	20652440		WM14*	2	06J 043	07J 043	440	650	646	646	464	650	ALIIXM	A
	10652416		WM14*	1	07J 043	08J 043	416	650	646	646	440	650	ALIIXM	A
	20621566		WM15*	2	04J 083	05J 104	566	396	0	400	650	420	ALIIXM	A
	10652456		WM15*	1	05J 104	06J 104	456	650	646	646	480	650	ALIIXM	A
	20652432		WM15*	2	06J 104	07J 104	432	650	646	646	456	650	ALIIXM	A
	10652408		WM15*	1	07J 104	08J 104	408	650	646	646	432	650	ALIIXM	A
	20652416		WM16*	2	01J 091	08J 044	416	654	602	0	576	598	ALIIXM	A
	10652408		WM17*	1	02J 091	08J 105	408	654	602	0	552	598	ALIIXM	A
	20652416		WM18*	2	03J 091	08J 046	416	662	602	0	528	598	ALIIXM	A
	10652408		WM19*	1	04J 091	08J 106	408	658	602	0	504	598	ALIIXM	A
	20652416		WM20*	2	01J 093	08J 047	416	666	610	0	576	606	ALIIXM	A
	10652408		WM21*	1	02J 093	08J 107	408	662	610	0	552	606	ALIIXM	A
	20652416		WM22*	2	03J 093	08J 048	416	670	610	0	528	606	ALIIXM	A
	10652408		WM23*	1	04J 093	08J 108	408	666	610	0	504	606	ALIIXM	A
	20652416		WM24*	2	01J 101	08J 049	416	674	642	0	576	638	ALIIXM	A
	10652408		WM25*	1	02J 101	08J 109	408	670	642	0	552	638	ALIIXM	A

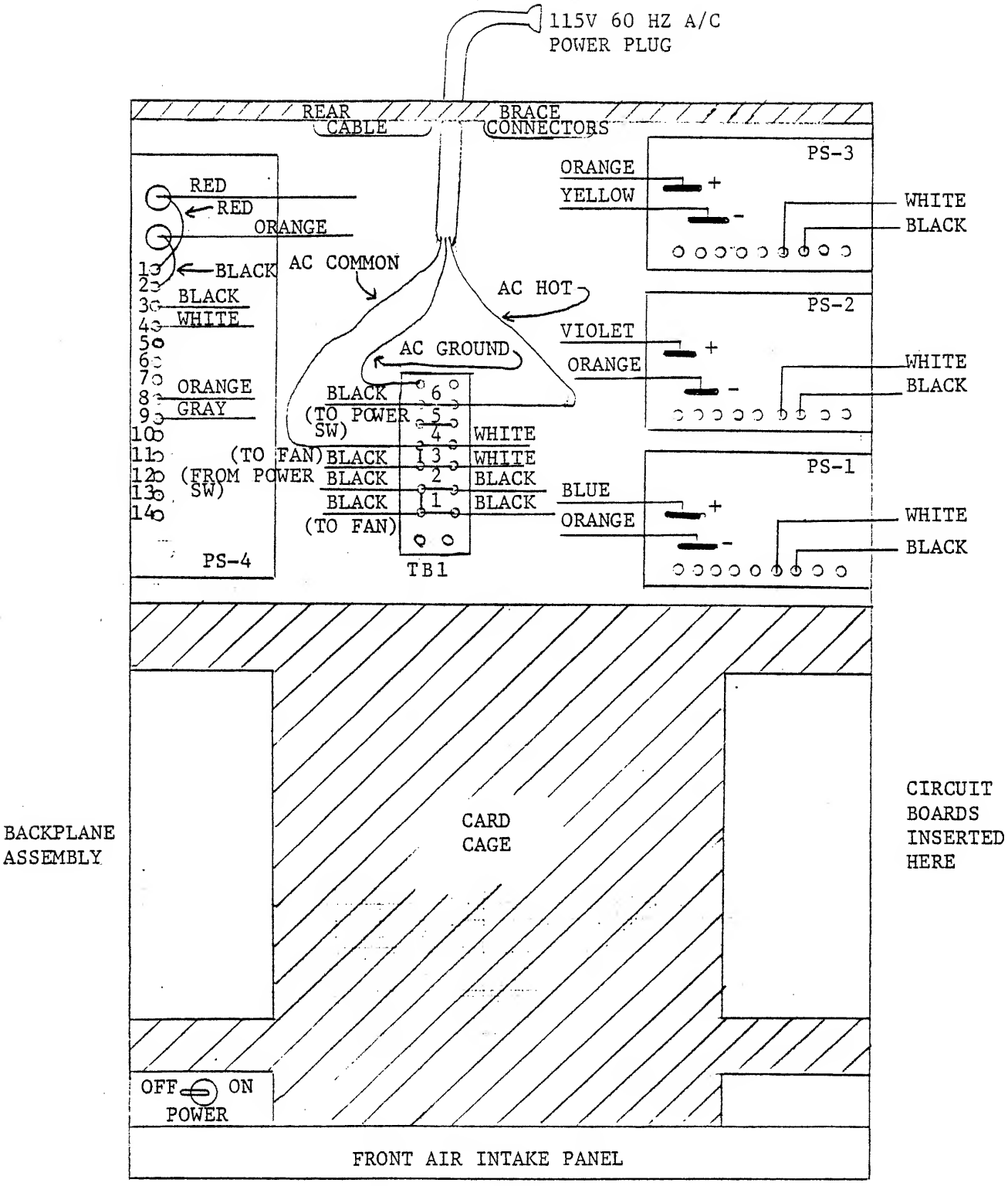
REFEREN	MACH=	LIST=	NAME	Z	FROM	TO	AX	AY	VIAA	VIAB	BX	BY	SYSTEM	REV
	20652416		WM26*	2	03J 101	08J 0[illegible]	416	678	642	0	528	638	ALIIXM	A
	10652408		WM27*	1	04J 101	08J 110	408	674	642	0	504	638	ALIIXM	A
	20652416		WM28*	2	01J 104	08J 051	416	682	654	0	576	650	ALIIXM	A
	10652408		WM29*	1	02J 104	08J [illegible]11	408	678	654	0	552	650	ALIIXM	A
	20652416		WM30*	2	03J 104	08J 052	416	686	654	0	528	650	ALIIXM	A
	10652408		WM31*	1	04J 104	08J 112	408	682	654	0	504	650	ALIIXM	A
	20653416		WM32*	2	01J 112	08J 054	416	694	686	0	576	682	ALIIXM	A
	10622502		WM32*	1	08J 054	09J 067	502	516	488	0	694	484	ALIIXM	A
	20653416		WM33*	2	02J 112	08J 055	416	698	686	0	552	682	ALIIXM	A
	10622506		WM33*	1	08J 055	09J 068	506	516	488	0	698	484	ALIIXM	A
	20653416		WM34*	2	03J 112	08J 056	416	702	686	0	528	682	ALIIXM	A
	10622510		WM34*	1	08J 056	09J 069	510	516	488	0	702	484	ALIIXM	A
	20653416		WM35*	2	04J 112	08J 057	416	706	686	0	504	682	ALIIXM	A
	10622514		WM35*	1	08J 057	09J 070	514	516	488	0	706	484	ALIIXM	A
	20653416		WM36*	2	01J 114	08J 058	416	710	694	0	576	690	ALIIXM	A
	10622518		WM36*	1	08J 058	09J 071	518	516	488	0	710	484	ALIIXM	A
	20653416		WM37*	2	02J 114	08J 059	416	714	694	0	552	690	ALIIXM	A
	10622522		WM37*	1	08J 059	09J 072	522	516	488	0	714	484	ALIIXM	A
	20653416		WM38*	2	03J 114	08J 060	416	718	694	0	528	690	ALIIXM	A
	10622526		WM38*	1	08J 060	09J 073	526	516	488	0	718	484	ALIIXM	A
	20652552		WRITE	2	01J 070	02J 070	552	514	510	510	576	514	ALIIXM	A
	10652528		WRITE	1	02J 070	03J 070	528	514	510	510	552	514	ALIIXM	A
	20652504		WRITE	2	03J 070	04J 070	504	514	510	510	528	514	ALIIXM	A
	10652480		WRITE	1	04J 070	05J 070	480	514	510	510	504	514	ALIIXM	A
	20652456		WRITE	2	05J 070	06J 070	456	514	510	510	480	514	ALIIXM	A
	10652432		WRITE	1	06J 070	07J 070	432	514	510	510	456	514	ALIIXM	A
	20622514		WRITE	2	07J 070	09J 043	514	468	0	472	650	508	ALIIXM	A
	10652456		XIOREF	1	05J 077	06J 077	456	542	538	538	480	542	ALIIXM	A
	20652432		XIOREF	2	06J 077	07J 077	432	542	538	538	456	542	ALIIXM	A
	10652384		XIOREF	1	07J 077	09J 077	384	542	538	538	432	542	ALIIXM	A
	20652464		XMAR(07)	2	05J 008	06J 008	464	510	506	506	488	510	ALIIXM	A
	10652440		XMAR(07)	1	06J 008	07J 008	440	510	506	506	464	510	ALIIXM	A
	20652392		XMAR(07)	2	07J 008	09J 008	392	510	506	506	440	510	ALIIXM	A
	10652464		XMAR(08)	1	05J 007	06J 007	464	506	502	502	488	506	ALIIXM	A
	20652440		XMAR(08)	2	06J 007	07J 007	440	506	502	502	464	506	ALIIXM	A
	10652392		XMAR(08)	1	07J 007	09J 007	392	506	502	502	440	506	ALIIXM	A
	20652464		XMAR(15)	2	05J 030	06J 030	464	598	594	594	488	598	ALIIXM	A
	10652440		XMAR(15)	1	06J 030	07J 030	440	598	594	594	464	598	ALIIXM	A
	20652392		XMAR(15)	2	07J 030	09J 040	392	638	602	0	440	598	ALIIXM	A
	10652320		ZEROBUS	1	11J 034	12J 034	320	614	610	610	344	614	ALIIXM	A

TOP



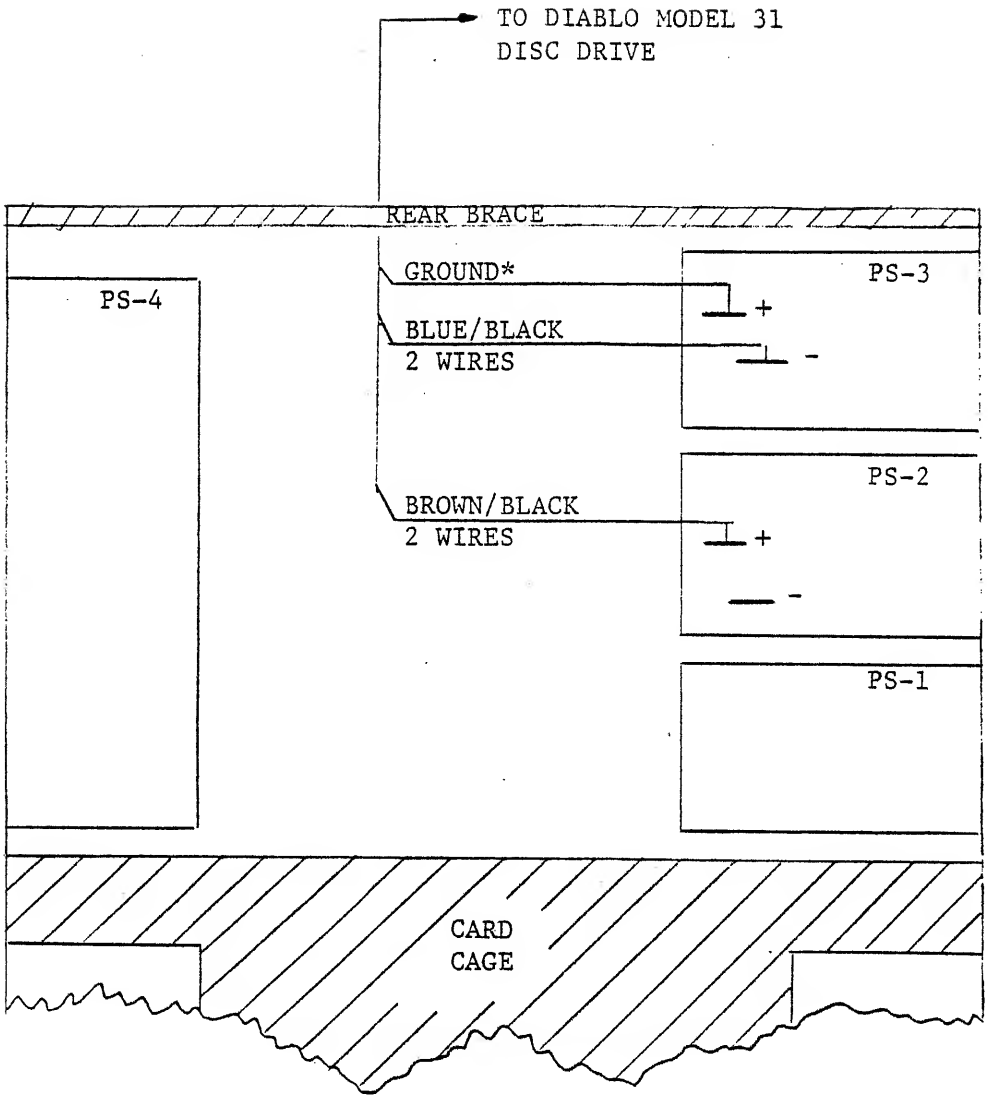
WIRE-WRAP SIDE

BACKPLANE ASSEMBLY



PS-1 = +12 VOLT POWER SUPPLY
PS-2 = +15 VOLT POWER SUPPLY
PS-3 = -15 VOLT POWER SUPPLY
PS-4 = ±5 VOLT POWER SUPPLY

ALTO II POWER WIRING DIAGRAM
(WITHOUT DISC DRIVE CONNECTIONS)



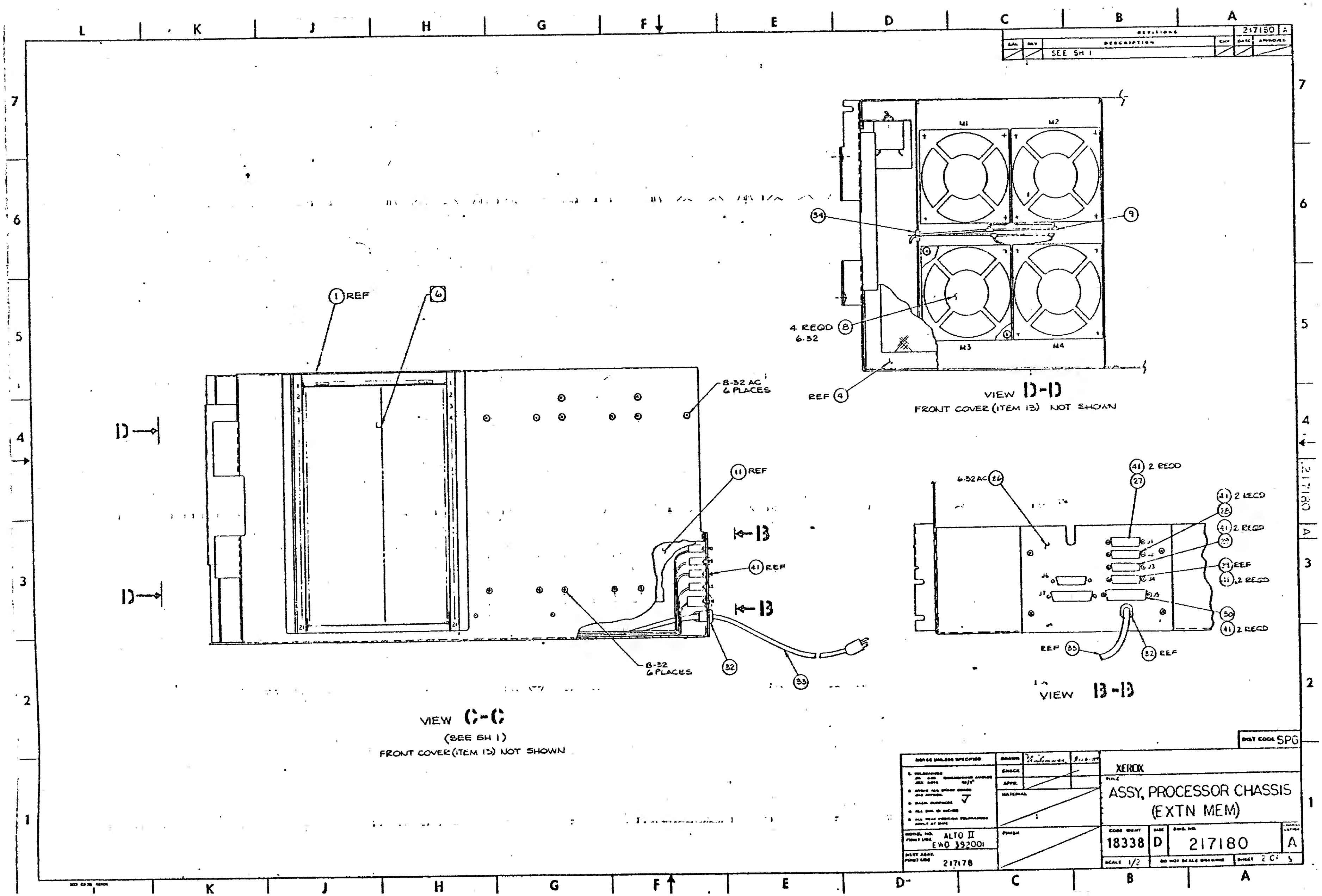
*NOTE: GROUND WIRE MAY BE EITHER A BARE WIRE OR A BARE WIRE WITH BLACK SHRINK TUBING ON IT.

PS-1 = +12 VOLT POWER SUPPLY
PS-2 = +15 VOLT POWER SUPPLY
PS-3 = -15 VOLT POWER SUPPLY
PS-4 = ±5 VOLT POWER SUPPLY

ALTO II POWER WIRING DIAGRAM

FOR DIABLO MODEL 31

DISC DRIVE



SEE SH 1
217180 A
(1) REF
(6)
8-32 AC 6 PLACES
(11) REF
(41) REF
8-32 6 PLACES
(32)
(33)
VIEW C-C
(SEE SH 1)
FRONT COVER (ITEM 13) NOT SHOWN
M1
M2
M3
M4
(34)
(9)
4 REQD (8) 6-32
REF (4)
VIEW D-D
FRONT COVER (ITEM 13) NOT SHOWN
6-32AC (26)
(41) 2 REQD
(27)
(25)
(30)
REF (33)
(32) REF
VIEW B-B
DIST CODE SPG
XEROX
ASSY, PROCESSOR CHASSIS
(EXTN MEM)
ALTO II
EWO 392001
217178
18338
D
217180
A
SCALE 1/2

ALTO II EXTENDED MEMORY LAYOUT

	BANK 0				BANK 1				BANK 2				BANK 3			
BIT	00000-77777		100000-177777		00000-77777		100000-177777		00000-77777		100000-177777		00000-77777		100000-177777	
	EVEN	ODD	EVEN	ODD	EVEN	ODD	EVEN	ODD	EVEN	ODD	EVEN	ODD	EVEN	ODD	EVEN	ODD
0	1-16	1-18	1-26	1-28	1-36	1-38	1-46	1-48	1-56	1-58	1-66	1-68	1-76	1-78	1-86	1-88
1	2-16	2-18	2-26	2-28	2-36	2-38	2-46	2-48	2-56	2-58	2-66	2-68	2-76	2-78	2-86	2-88
2	3-16	3-18	3-26	3-28	3-36	3-38	3-46	3-48	3-56	3-58	3-66	3-68	3-76	3-78	3-86	3-88
3	4-16	4-18	4-26	4-28	4-36	4-38	4-46	4-48	4-56	4-58	4-66	4-68	4-76	4-78	4-86	4-88
4	1-11	1-13	1-21	1-23	1-31	1-33	1-41	1-43	1-51	1-53	1-61	1-63	1-71	1-73	1-81	1-83
5	2-11	2-13	2-21	2-23	2-31	2-33	2-41	2-43	2-51	2-53	2-61	2-63	2-71	2-73	2-81	2-83
6	3-11	3-13	3-21	3-23	3-31	3-33	3-41	3-43	3-51	3-53	3-61	3-63	3-71	3-73	3-81	3-83
7	4-11	4-13	4-21	4-23	4-31	4-33	4-41	4-43	4-51	4-53	4-61	4-63	4-71	4-73	4-81	4-83
8	1-17	1-19	1-27	1-29	1-37	1-39	1-47	1-49	1-57	1-59	1-67	1-69	1-77	1-79	1-87	1-89
9	2-17	2-19	2-27	2-29	2-37	2-39	2-47	2-49	2-57	2-59	2-67	2-69	2-77	2-79	2-87	2-89
10	3-17	3-19	3-27	3-29	3-37	3-39	3-47	3-49	3-57	3-59	3-67	3-69	3-77	3-79	3-87	3-89
11	4-17	4-19	4-27	4-29	4-37	4-39	4-47	4-49	4-57	4-59	4-67	4-69	4-77	4-79	4-87	4-89
12	1-12	1-14	1-22	1-24	1-32	1-34	1-42	1-44	1-52	1-54	1-62	1-64	1-72	1-74	1-82	1-84
13	2-12	2-14	2-22	2-24	2-32	2-34	2-42	2-44	2-52	2-54	2-62	2-64	2-72	2-74	2-82	2-84
14	3-12	3-14	3-22	3-24	3-32	3-34	3-42	3-44	3-52	3-54	3-62	3-64	3-72	3-74	3-82	3-84
15	4-12	4-14	4-22	4-24	4-32	4-34	4-42	4-44	4-52	4-54	4-62	4-64	4-72	4-74	4-82	4-84

	BANK 0		BANK 1		BANK 2		BANK 3	
H0	1-20	1-30	1-40	1-50	1-60	1-70	1-80	1-90
H1	2-20	2-30	2-40	2-50	2-60	2-70	2-80	2-90
H2	3-20	3-30	3-40	3-50	3-60	3-70	3-80	3-90
H3	4-20	4-30	4-40	4-50	4-60	4-70	4-80	4-90
H4	1-15	1-25	1-35	1-45	1-55	1-65	1-75	1-85
H5	2-15	2-25	2-35	2-45	2-55	2-65	2-75	2-85
P	3-15	3-25	3-35	3-45	3-55	3-65	3-75	3-85

NOTE: LOCATIONS ARE CARD-CHIP

ALTOII MEMORY

ADDRESS MAPPING

The mapping of addresses to memory chips can be altered by the setting of the "memory configuration switch". This switch is located at the top of the backplane of the AltoII. If the switch is in the alternate position, the first and second 32K portions of memory are exchanged.

The AltoII memory system is organized around 32-bit doublewords. Stored along with each doubleword is 6 bits of Hamming code and a Parity bit for a total of 39 bits:

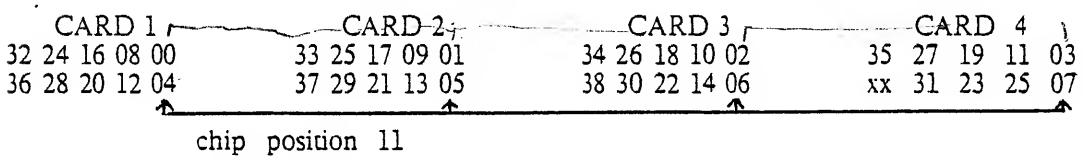
bits 0-15	even data word
bits 16-31	odd data word
bits 32-37	Hamming code
bit 38	Parity bit

Things are further complicated by the fact that two types of memory chips are used: 16K chips in machines with extended memory and 4K chips for all others.

The bits in a 1-word deep slice of memory are called a group. A group contains 4K or 16K doublewords, depending on the chip type. The bits of a group on a single board are called a subgroup. Thus a subgroup contains 10 of the 40 bits in a group. There are 8 subgroups on a memory board. Subgroups are numbered from the high 3 bits of the address: for 4K chips this means MAR[0-2]; for 16K chips (i.e., an Alto with extended memory) this means BANK.MAR[0]:

Subgroup	Chip Positions	
7	81-90	
6	71-80	
5	61-70	
4	51-60	
3	41-50	
2	31-40	
1	21-30	
0	11-20	Nearest the edge connector

The location of the bits in group 0 is:



Chips 15, 25, 35, 45, 55, 65, 76, and 85 on board 4 aren't used. If you are out of replacement memory chips, you can use one of these, but then the board with the missing chips will only work in Slot 4.

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6	71-80	
5	61-70	
4	51-60	
3	41-50	
2	31-40	
1	21-30	
0	11-20	Nearest the edge connector

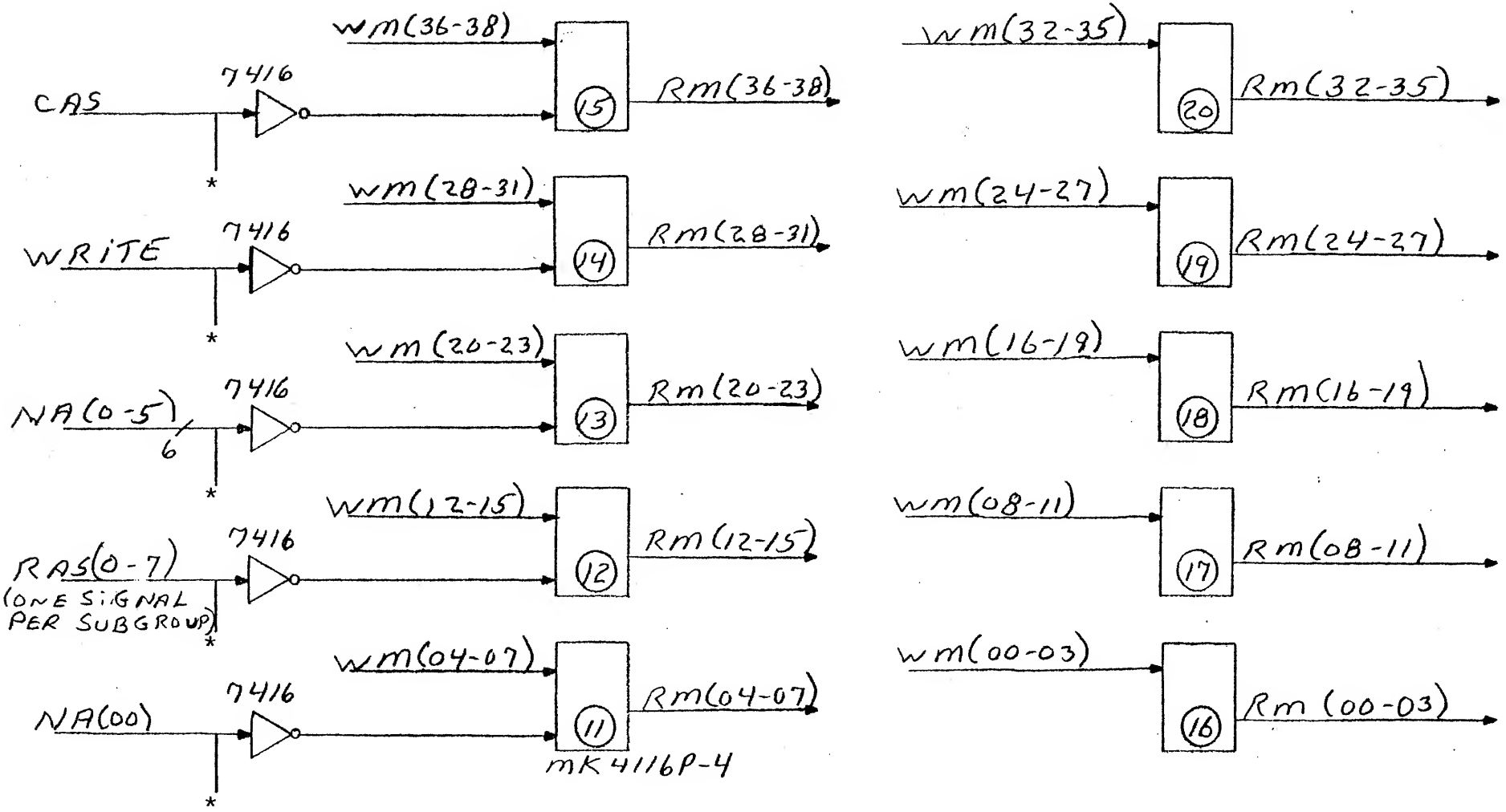
The location of the bits in group 0 is:

CARD 1	CARD 2	CARD 3	CARD 4
32 24 16 08 00	33 25 17 09 01	34 26 18 10 02	35 27 19 11 03
36 28 20 12 04	37 29 21 13 05	38 30 22 14 06	xx 31 23 25 07

chip position 11

Chips 15, 25, 35, 45, 55, 65, 76, and 85 on board 4 aren't used. If you are out of replacement memory chips, you can use one of these, but then the board with the missing chips will only work in Slot 4.

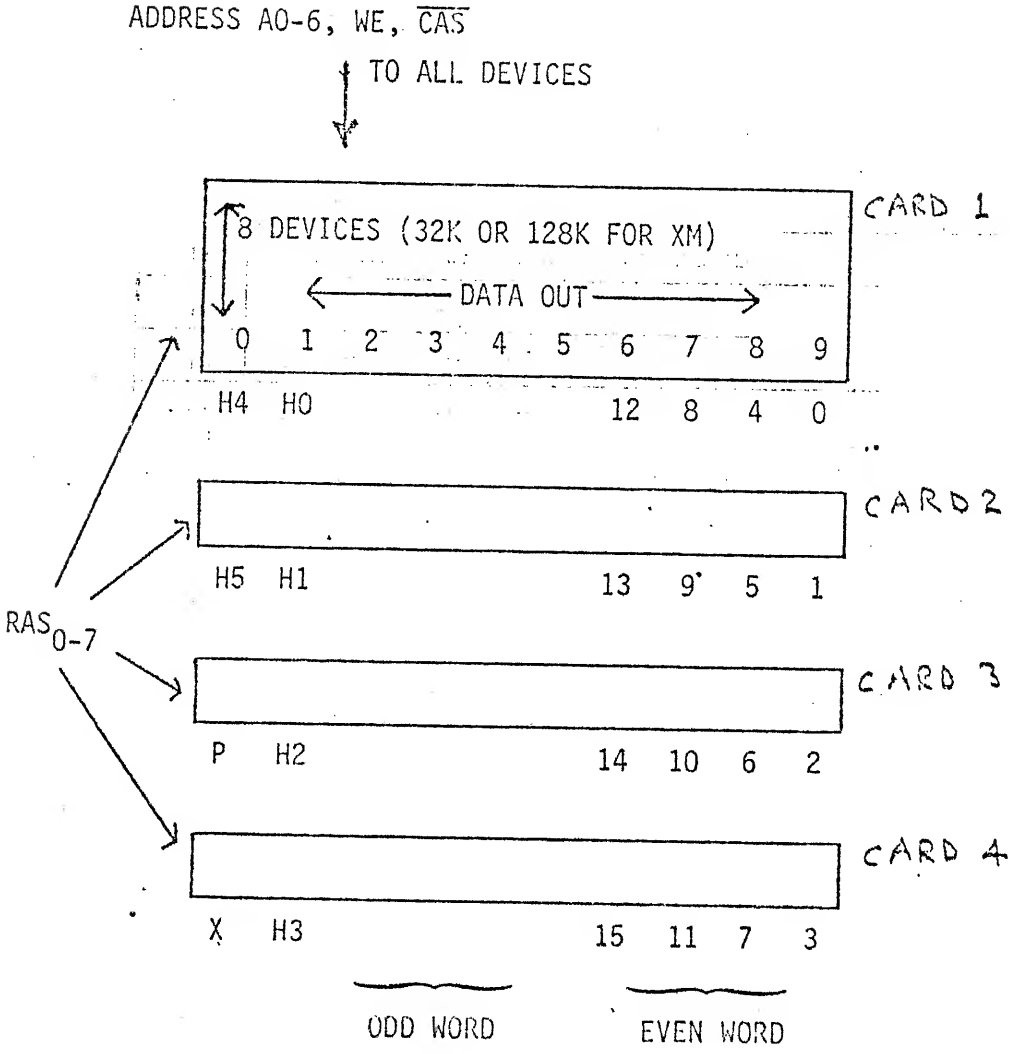
MEMORY STORAGE MODULE
(ONE SUBGROUP)
(ALL EIGHT SUBGROUPS ARE IDENTICAL)



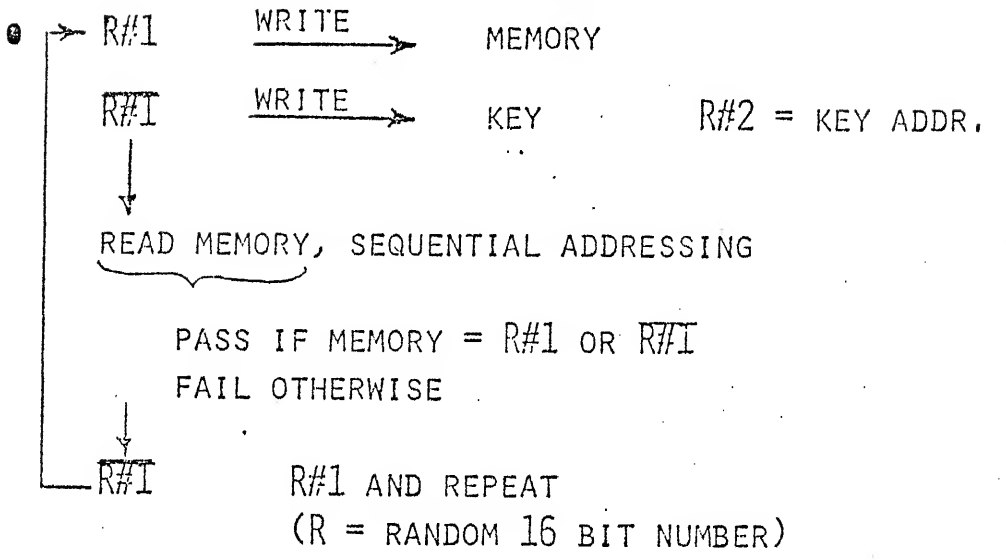
* TO ALL MEMORY CHIPS

ALTO MEMORY

- WORD = 16 BITS
- ACCESS → 2 WORDS AT A TIME
  → 32 BITS + 6 BITS EC + PARITY + SPARE = 40 BITS
- 10 BITS/MODULE 80 DRAMS/MODULE
- 4 MODULES/ALTO 320 DRAMS/ALTO



DMT - DIAGNOSTIC MEMORY TEST



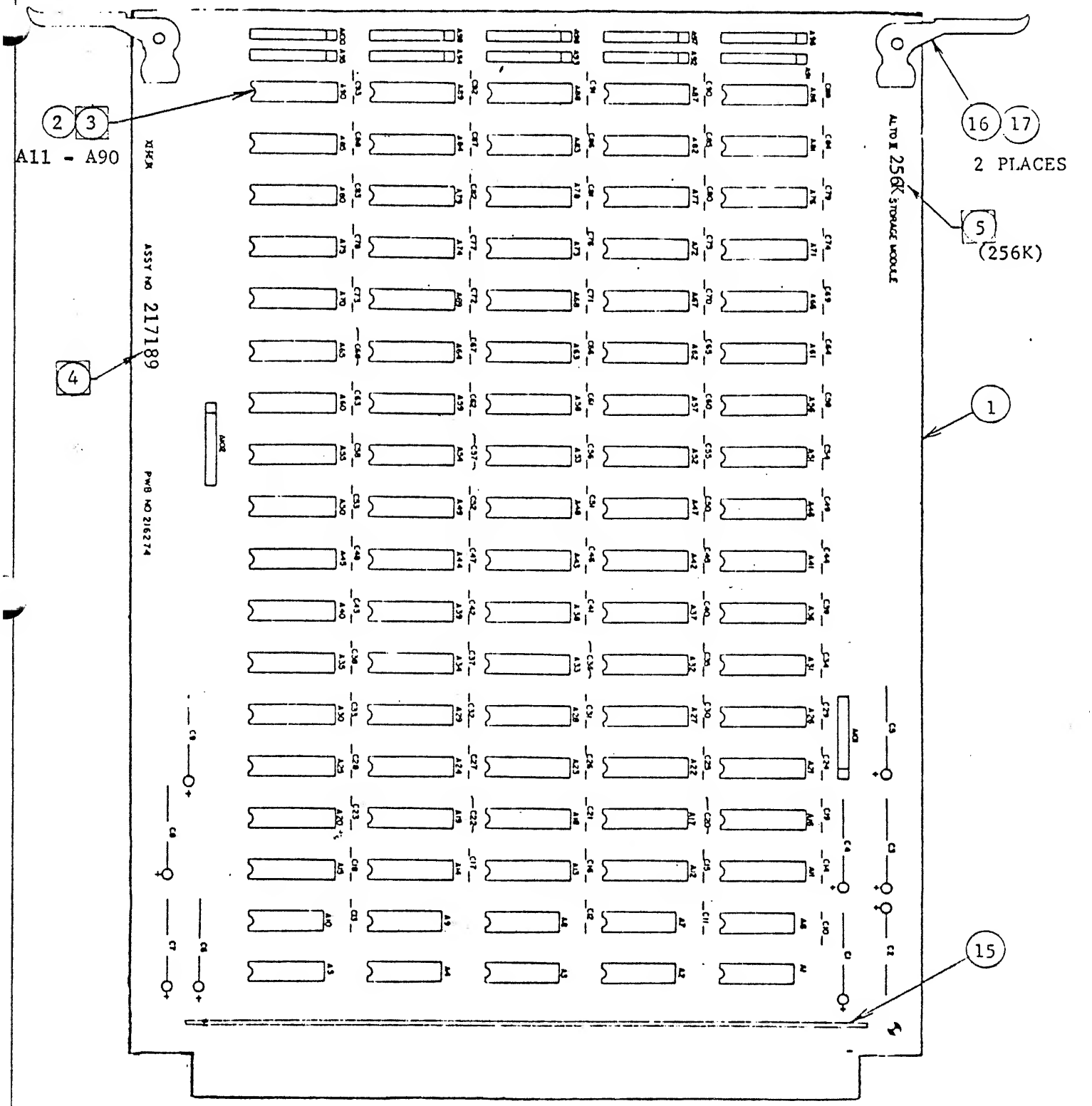
- EVERY OTHER COMPLETE TRIAL IS RUN WITHOUT ERROR CORRECTION AND RESULTS COMPARED.
- NUMBER OF ERRORS IS STORED IN 320 WORDS OF MEMORY (65K ERRORS MAX.).
- ON SCREEN CURSOR JUMPS ONCE EACH TIME THROUGH THE MAIN DMT LOOP.
- S KEY CAUSES STATUS DISPLAY AND TRANSMIT ON NET. AUTO TRANSMIT EVERY 10K PASSES THROUGH DMT.
- PEEK LOOKS AT NET AND STORES ALL DMT TRANSMISSION ON THAT NET.

ALTO II EXTENDED MEMORY LAYOUT

	BANK 0				BANK 1				BANK 2				BANK 3			
BIT	00000-77777		100000-177777		00000-77777		100000-177777		00000-77777		100000-177777		00000-77777		100000-177777	
	EVEN	ODD	EVEN	ODD	EVEN	ODD	EVEN	ODD	EVEN	ODD	EVEN	ODD	EVEN	ODD	EVEN	ODD
0	1-16	1-18	1-26	1-28	1-36	1-38	1-46	1-48	1-56	1-58	1-66	1-68	1-76	1-78	1-86	1-88
1	2-16	2-18	2-26	2-28	2-36	2-38	2-46	2-48	2-56	2-58	2-66	2-68	2-76	2-78	2-86	2-88
2	3-16	3-18	3-26	3-28	3-36	3-38	3-46	3-48	3-56	3-58	3-66	3-68	3-76	3-78	3-86	3-88
3	4-16	4-18	4-26	4-28	4-36	4-38	4-46	4-48	4-56	4-58	4-66	4-68	4-76	4-78	4-86	4-88
4	1-11	1-13	1-21	1-23	1-31	1-33	1-41	1-43	1-51	1-53	1-61	1-63	1-71	1-73	1-81	1-83
5	2-11	2-13	2-21	2-23	2-31	2-33	2-41	2-43	2-51	2-53	2-61	2-63	2-71	2-73	2-81	2-83
6	3-11	3-13	3-21	3-23	3-31	3-33	3-41	3-43	3-51	3-53	3-61	3-63	3-71	3-73	3-81	3-83
7	4-11	4-13	4-21	4-23	4-31	4-33	4-41	4-43	4-51	4-53	4-61	4-63	4-71	4-73	4-81	4-83
8	1-17	1-19	1-27	1-29	1-37	1-39	1-47	1-49	1-57	1-59	1-67	1-69	1-77	1-79	1-87	1-89
9	2-17	2-19	2-27	2-29	2-37	2-39	2-47	2-49	2-57	2-59	2-67	2-69	2-77	2-79	2-87	2-89
10	3-17	3-19	3-27	3-29	3-37	3-39	3-47	3-49	3-57	3-59	3-67	3-69	3-77	3-79	3-87	3-89
11	4-17	4-19	4-27	4-29	4-37	4-39	4-47	4-49	4-57	4-59	4-67	4-69	4-77	4-79	4-87	4-89
12	1-12	1-14	1-22	1-24	1-32	1-34	1-42	1-44	1-52	1-54	1-62	1-64	1-72	1-74	1-82	1-84
13	2-12	2-14	2-22	2-24	2-32	2-34	2-42	2-44	2-52	2-54	2-62	2-64	2-72	2-74	2-82	2-84
14	3-12	3-14	3-22	3-24	3-32	3-34	3-42	3-44	3-52	3-54	3-62	3-64	3-72	3-74	3-82	3-84
15	4-12	4-14	4-22	4-24	4-32	4-34	4-42	4-44	4-52	4-54	4-62	4-64	4-72	4-74	4-82	4-84

	BANK 0		BANK 1		BANK 2		BANK 3	
H0	1-20	1-30	1-40	1-50	1-60	1-70	1-80	1-90
H1	2-20	2-30	2-40	2-50	2-60	2-70	2-80	2-90
H2	3-20	3-30	3-40	3-50	3-60	3-70	3-80	3-90
H3	4-20	4-30	4-40	4-50	4-60	4-70	4-80	4-90
H4	1-15	1-25	1-35	1-45	1-55	1-65	1-75	1-85
H5	2-15	2-25	2-35	2-45	2-55	2-65	2-75	2-85
P	3-15	3-25	3-35	3-45	3-55	3-65	3-75	3-85

NOTE: LOCATIONS ARE CARD-CHIP



Title
ASSY, PRINTED WIRING -
256K STORAGE

Xerox Corporation
El Segundo, California

XEROX

217189 A

Sheet 3 Of 4

Xerox Corporation
701 South Aviation Boulevard
El Segundo, California 90245

XEROX

MATERIAL LIST

ML	Drawing No.	Rev.
	217189	A

Rev.	Drawing Title
A	ASSEMBLY, PRINTED WIRING- 256K STORAGE

Dwg. No. 217189

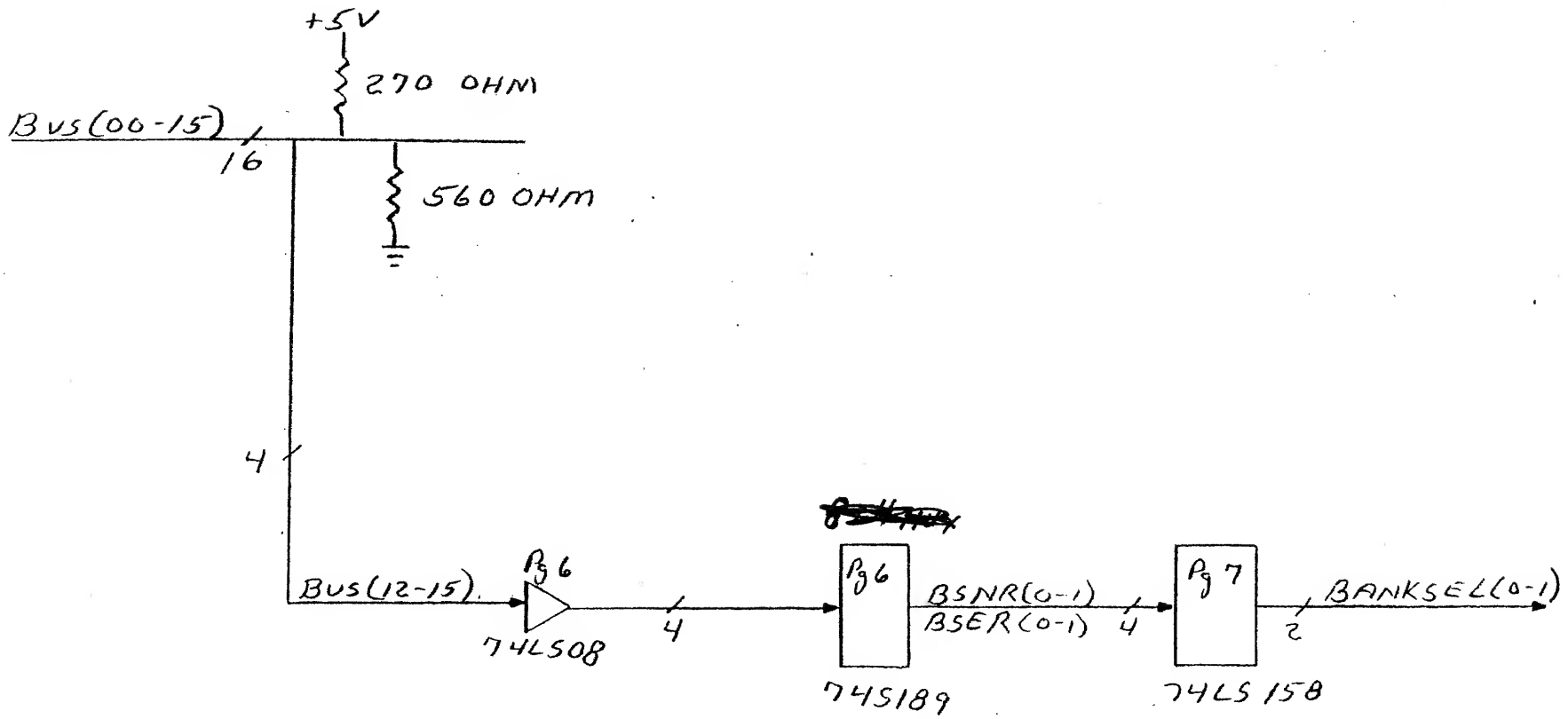
ML

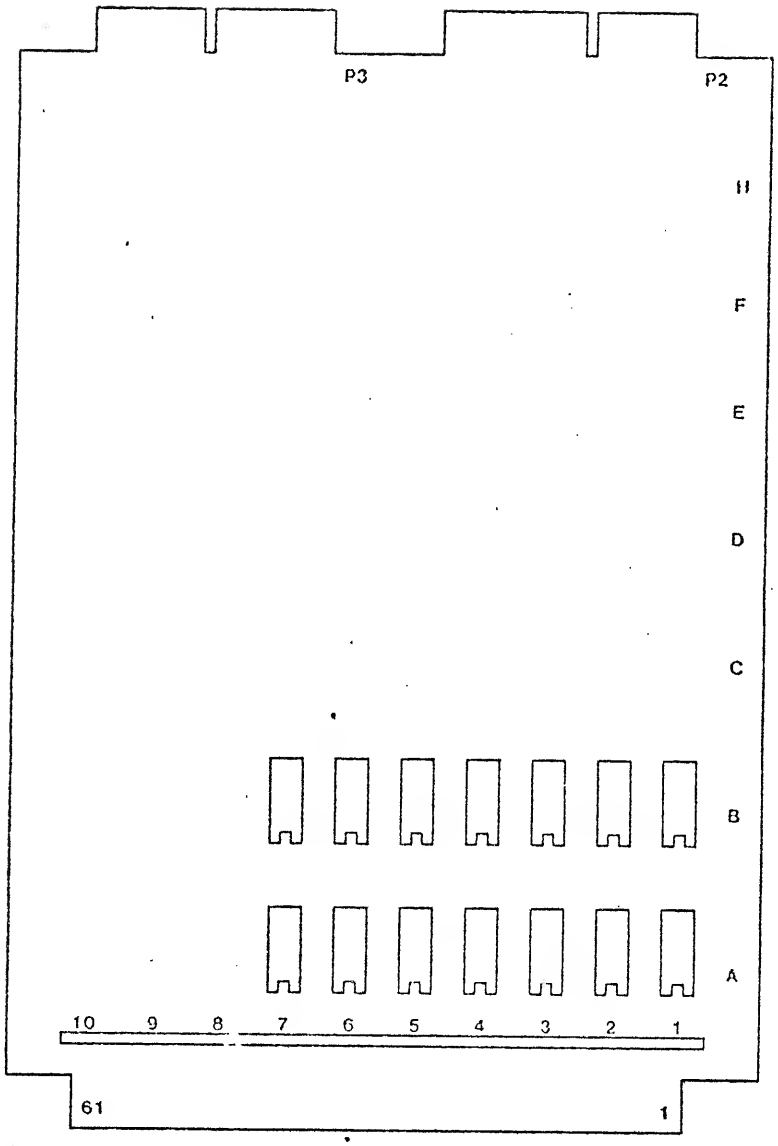
XM256K-ML

Model No.	Date	Sheet
ALTO II XM	3-21-78	4 Of 4

Item No.	Drawing Title	Drawing No.	No. Req.	Remarks
1	BOARD, PRINTED WIRING	216274 B	1	
2	MICROCIRCUIT MK4116P-4		80	A11 THRU 90
3	MICROCIRCUIT 7416	213437	10	A1 THRU 10
4				
5	RESISTOR, NETWORK 220 OHM	188600-003	12	A91 THRU 102
6	CAPACITOR, TANT. 18 UF, 50 V	123300-186	4	C6 THRU 9
7	CAPACITOR, TANT. 22 UF, 15 V	187720-005	5	C1 THRU 5
8	CAPACITOR, CERAMIC .01 UF, 50 V	188483-001	85	C10 THRU 93
9				
10	SOCKET, 16 PIN AUGAT #516-AG11D		80	A11 THRU 90
11	SOCKET, 14 PIN AUGAT #514-AG11D		10	A1 THRU 10
12				
13	STIFFENER, MODULE	216242	1	
14	EXTRACTOR, MODULE	216250	2	
15	RIVET, BLIND, PULL-THRU	156111-005	2	

MEMORY EXTENSION AND TERMINATOR MODULE (MEAT)





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Title
ALTO II
ASSEMBLY, PRINTED WIRING -
MEMORY EXTENSION AND TERMINATOR
MODULE

Xerox Corporation
El Segundo, California XEROX

216646 B

Sheet 3 of 7

El Segundo, California 90245

MATERIAL LIST

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ML	Drawing No.	Rev.
	216646	B

Rev. B

Drawing Title

ALTO II

ASSEMBLY, PRINTED WIRING -

MEMORY EXTENSION AND TERMINATOR

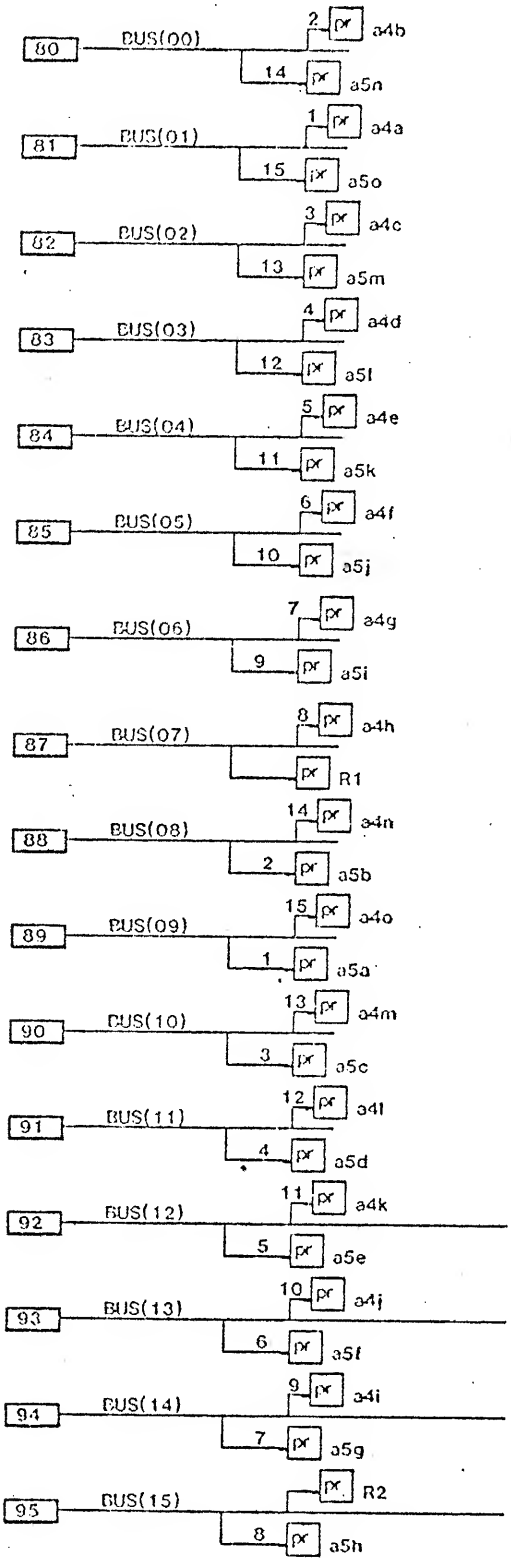
MODULE

Dwg No. 2 1 6 6 4 6

Model No.	Date	Sheet
ALTO II	8-26-77	4 Of 7

Item No.	Drawing Title		Drawing No.	No. Req.	Remarks
1	BOARD, P.W. -MEMORY EXTENSION AND TERMINATOR		216648	1	
2					
ML 3	RESISTOR, NETWORK, DIP 270			1	A4 (A-B #316-A-271)
4	RESISTOR, NETWORK, DIP 560			1	A5 (A-B #316-A-561)
5	RESISTOR, FILM, 560 OHM, +5% -5%, 1/4 W		116447-561	1	R1
6	RESISTOR, FILM, 270 OHM, +5% -5%, 1/4 W		116447-271	1	R2
7	RESISTOR, FILM, 1 K OHM, +5% -5%, 1/4 W		116447-102	1	R3
8					
9	CAPACITOR, .01uF, 50V CERAMIC		188483-001	12	C2-C13
10	CAPACITOR, 22uF, 15V TANTALUM		187720-005	1	C1
11					
12	MICROCIRCUIT, 74S02	T.I.		1	A1
13	MICROCIRCUIT, 74S04	T.I.		2	A3, A7
14	MICROCIRCUIT, 74LS08	T.I.		1	B5
15	MICROCIRCUIT, 74S30	T.I.		1	A2
16	MICROCIRCUIT, 74S32	T.I.		1	B1
17	MICROCIRCUIT, 7438	T.I.		1	A6
18	MICROCIRCUIT, 74LS158	T.I.		2	B4, B7
19	MICROCIRCUIT, 74S189	T.I.		1	B6
20	MICROCIRCUIT, I3205	INTEL		2	B2, B3
21					
22					
23	STIFFENER		216242	1	
24	EXTRACTOR, MODULE		216250	2	
25	RIVET, BLIND PULL THRU		156111-005	2	
26					
27	SOCKET, MICROCIRCUIT	16 PIN	516-AG11D	7	AUGAT
28	SOCKET, MICROCIRCUIT	14 PIN	514-AG11D	7	AUGAT
29					
30	ALTO II MODULE ASSY SPECIFICATION		216207	REF	

NOTE: R2 IS 270 OHMS TO +5V; R1 IS 560 OHMS TO GROUND
TYPICAL OF ALL BUS(00) - BUS(15) LINES



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Title
ALTO II
ASSEMBLY, PRINTED WIRING -
MEMORY EXTENSION AND TERMINATOR
MODULE

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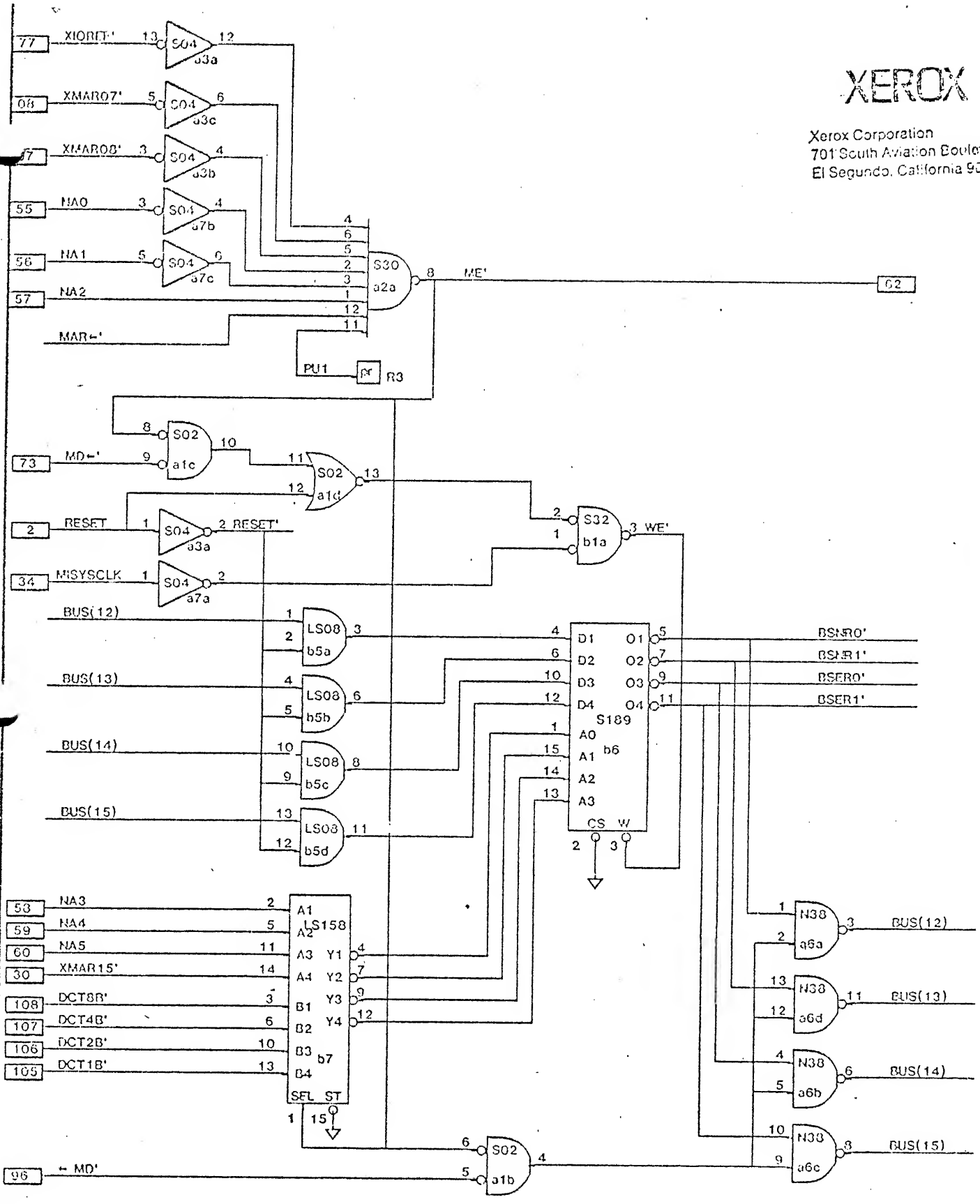
El Segundo, California XEROX

216646 B

Sheet 5 of 7



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Title
ALTO II
ASSEMBLY, PRINTED WIRING -
MEMORY EXTENSION AND TERMINATOR MODULE

Xerox Corporation
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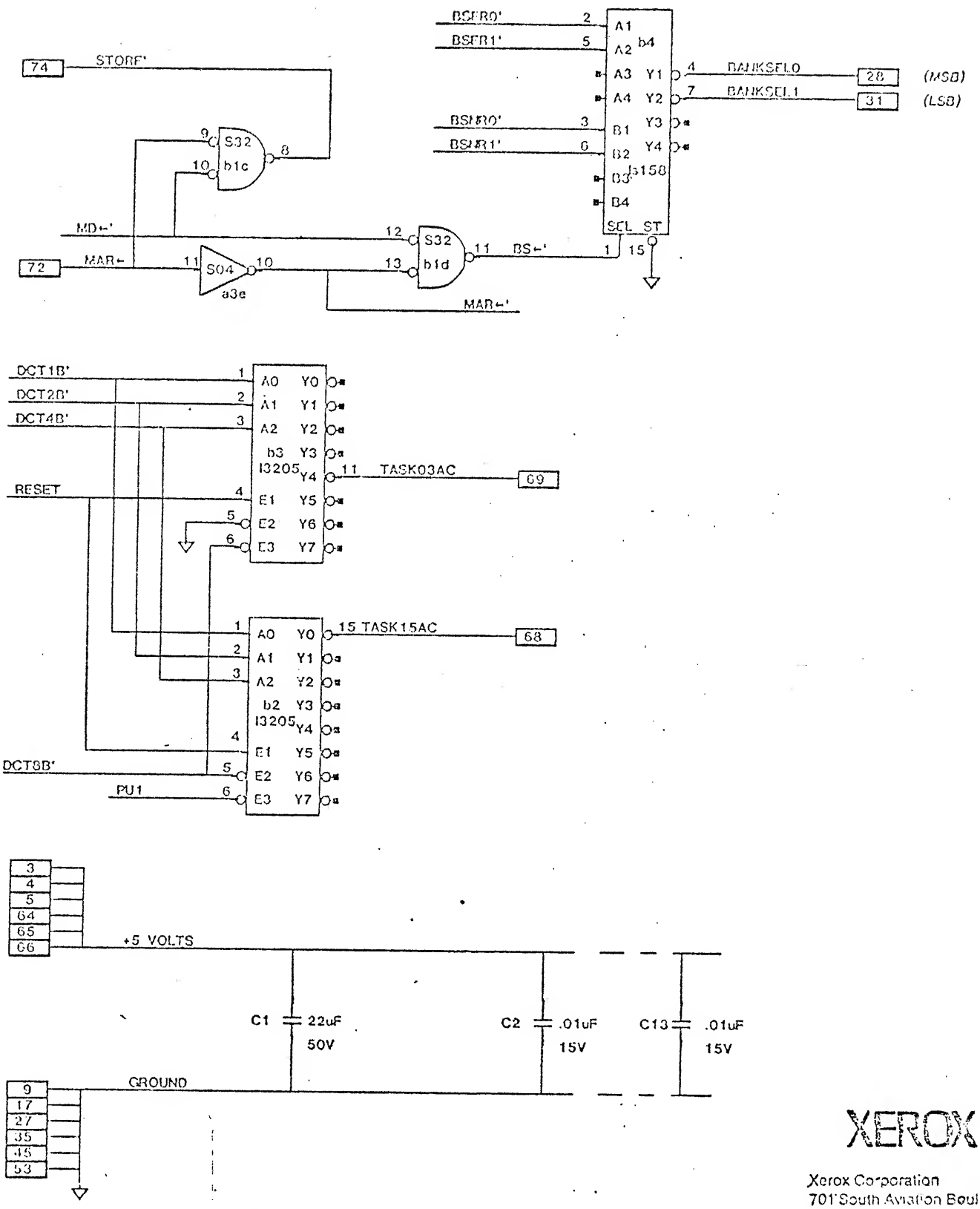
XEROX

216646 B

Sheet 6 Of 7



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Title
ALTO II
ASSEMBLY, PRINTED WIRING -
MEMORY EXTENSION AND TERMINATOR
MODULE

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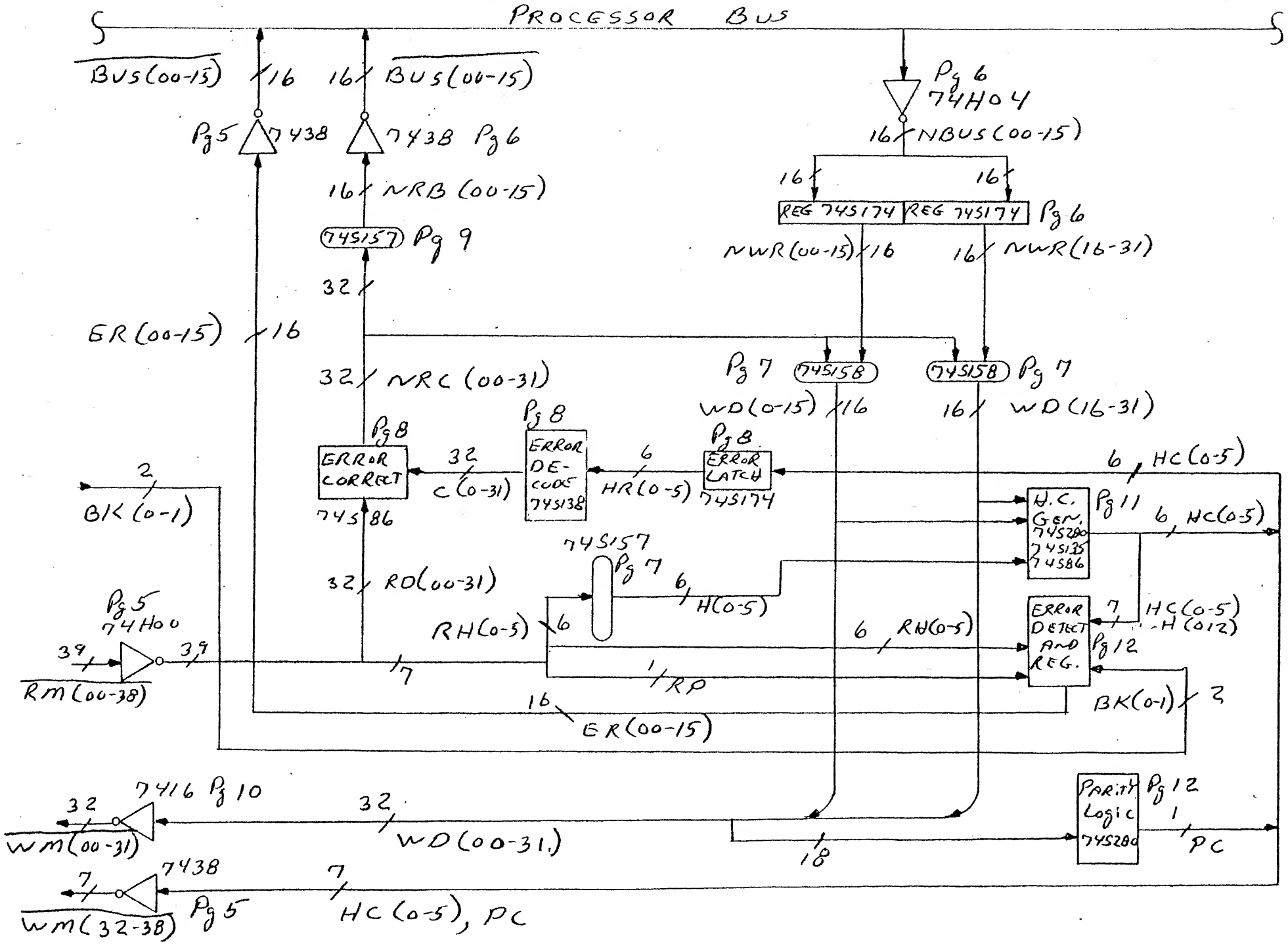
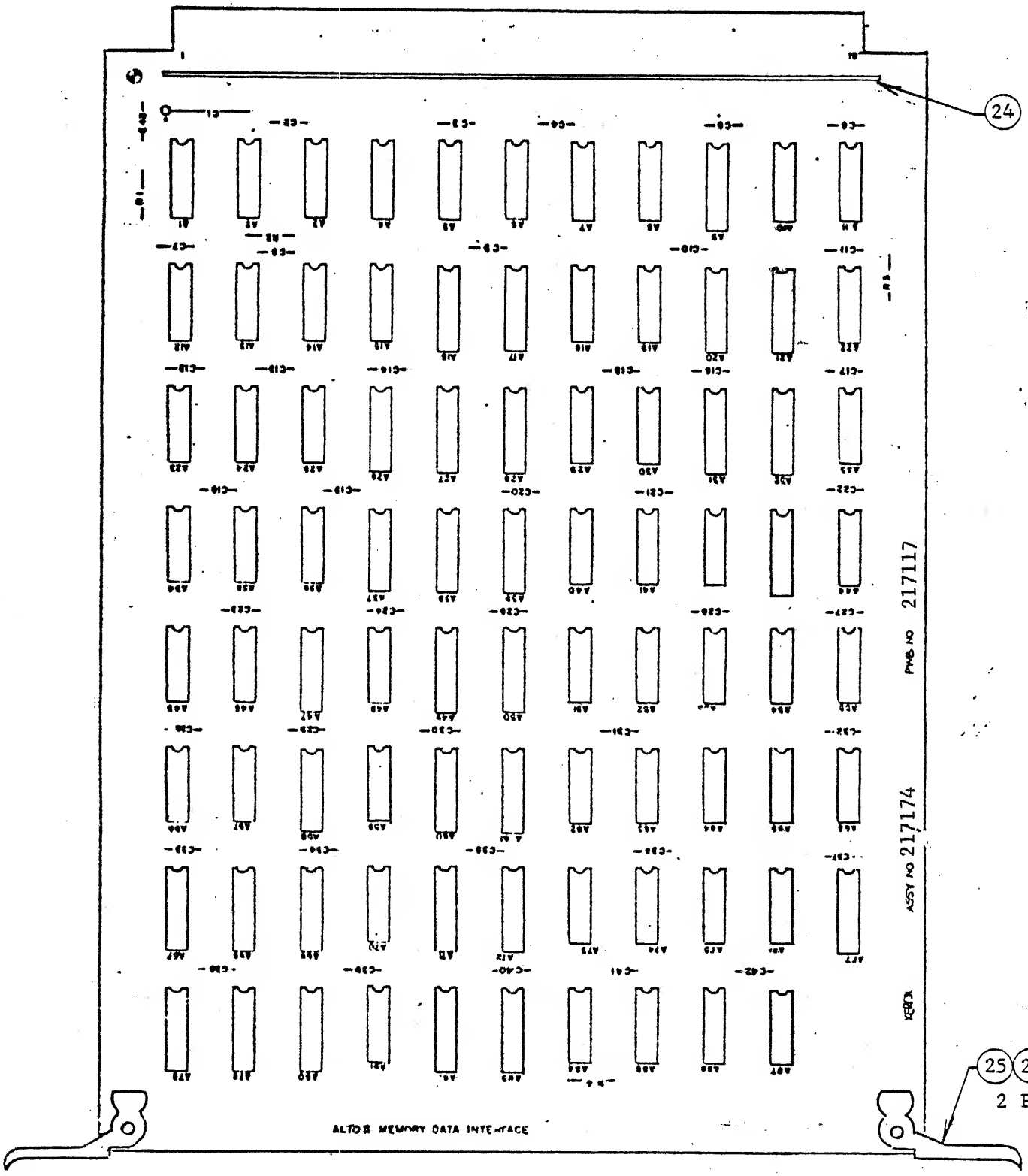
XEROX

216646 B

Sheet 7 Of 7

EXTENDED MEMORY DATA INTERFACE MODULE (EDIM) (XM)





Title
ASSY, PRINTED WIRING-
MEMORY DATA INTERFACE
(EXTENDED MEMORY)

Xerox Corporation
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XEROX

217174 C

Sheet 3 Of

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213 679-4511

XEROX

Material List

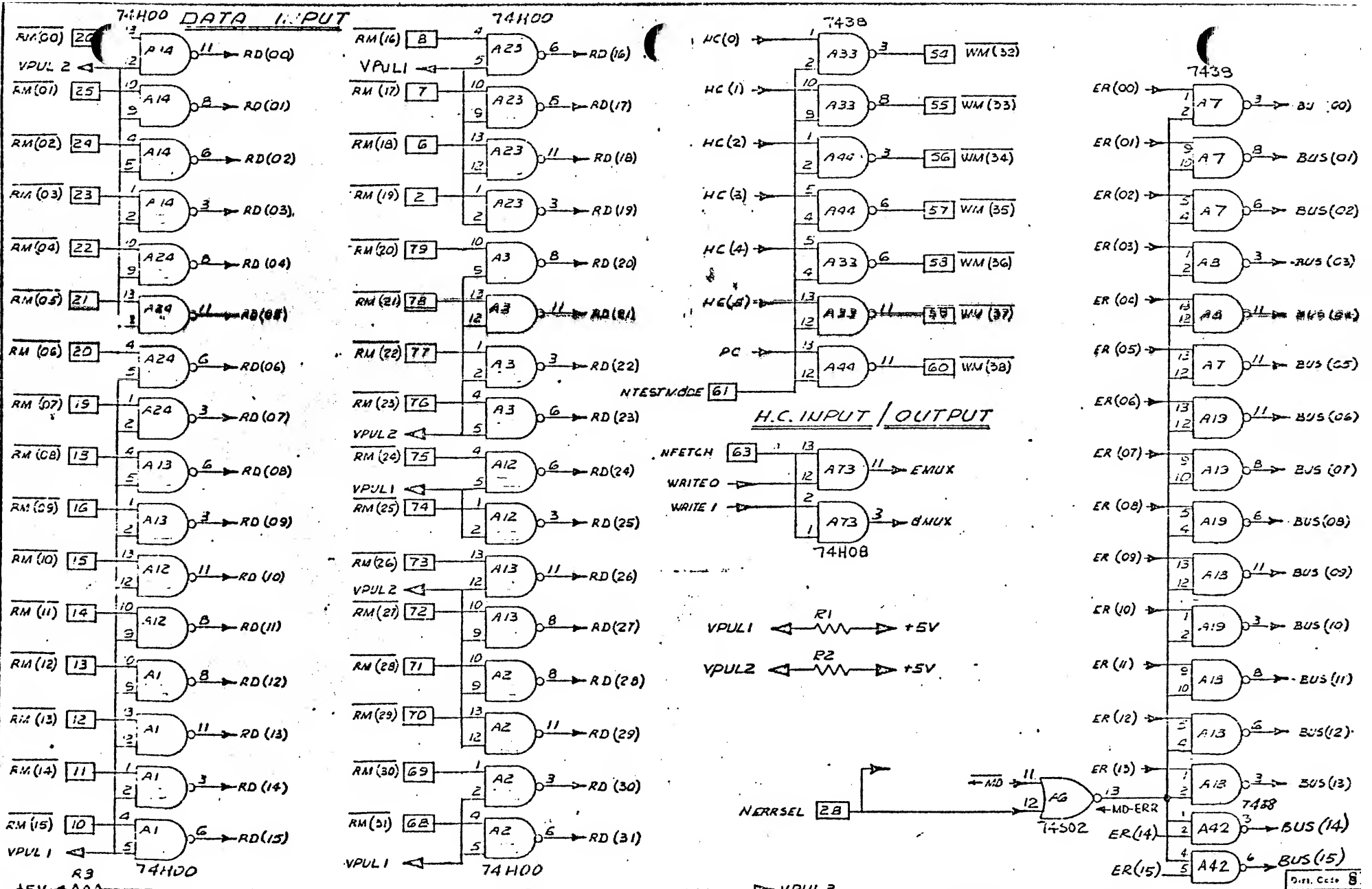
ML	Drawing No.	Rev.
	217174	C

Drawing Title
ASSEMBLY, P.W.
ALTO II
MEMORY DATA INTERFACE (EXTN MEM.)

Model No.	Date	Sheet
ALTO II XM	3/10/78	4 Of

R
ML Drawing No. 217174

Item No.	Drawing Title	Drawing No.	No. Req.	Remarks
1	Board, P.W.	217117	1	
2	Procedure, Test	216313	Ref.	
3	Spec, Module Assembly	216207	Ref	
4	Microcircuit 7416		6	A29, 40, 51, 52, 53, 62
5	74H04		3	A5, 70, 81
6	7438		11	A4, 7, 8, 15, 18, 19, 33, 44
				48, 59, 42
7	74H00		10	A1, 2, 3, 10, 11, 12, 13
				14, 23, 24
8	74H08		2	A73, 41
9	74S86		9	A25, 34, 35, 36, 45, 46,
				55, 56, 57
10	74S138		5	A67, 68, 69, 78, 79
11	74S280		12	A54, 63, 64, 65, 66, 74,
				75, 76, 84 thru 87
12	74H30		1	A22
13	74S158		8	A27, 28, 38, 39, 49, 50,
				60, 61
14	74S157		6	A31, 26, 32, 37, 47, 58
15	74S135		1	A77
16	74S174		8	A9, 16, 17, 71, 72, 80,
				82, 83
17	74S175		3	A20, 21, 43
18	Microcircuit 74S02		2	A6, 30
19				
20	Rivet	156111-005	2	
21	Resistor, Film, 1K, +5%, 1/4w	116447-102	3	R1, R2, R3
22	Capacitor, Tant, 22μF, +20%, 15V	187720-005	1	C1
23	Capacitor, Ceramic, .01μF, 50V	188483-001	42	C2 thru 43
24	Stiffener	216242	1	
25	Extractor	216250	2	
26	Socket, Microcircuit 14 Pin	514-AG11D	55	
27	Socket, Microcircuit 16 Pin	516-AG11D	30	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RM(00) 20
VPUL 2
RM(01) 25
RM(02) 24
RM(03) 23
RM(04) 22
RM(05) 21
RM(06) 20
RM(07) 19
RM(08) 13
RM(09) 16
RM(10) 15
RM(11) 14
RM(12) 13
RM(13) 12
RM(14) 11
RM(15) 10
VPUL 1
A14
A24
A13
A12
A1
RD(00)
RD(01)
RD(02)
RD(03)
RD(04)
RD(05)
RD(06)
RD(07)
RD(08)
RD(09)
RD(10)
RD(11)
RD(12)
RD(13)
RD(14)
RD(15)
74H00
RM(16) 8
VPUL1
RM(17) 7
RM(18) 6
RM(19) 2
RM(20) 79
RM(21) 78
RM(22) 77
RM(23) 76
VPUL2
RM(24) 75
VPUL1
RM(25) 74
RM(26) 73
VPUL2
RM(27) 72
RM(28) 71
RM(29) 70
RM(30) 69
RM(31) 68
VPUL1
A23
A3
A12
A13
A2
RD(16)
RD(17)
RD(18)
RD(19)
RD(20)
RD(21)
RD(22)
RD(23)
RD(24)
RD(25)
RD(26)
RD(27)
RD(28)
RD(29)
RD(30)
RD(31)
74H00
7438
HC(0)
HC(1)
HC(2)
HC(3)
HC(4)
HC(5)
PC
NTESTMODE 61
A33
A44
WM(32) 54
WM(33) 55
WM(34) 56
WM(35) 57
WM(36) 58
WM(37) 59
WM(38) 60
H.C. INPUT / OUTPUT
NFETCH 63
WRITE0
WRITE 1
A73
EMUX
dMUX
74H08
VPUL1
VPUL2
R1
R2
+5V
NERRSEL 28
MD 11
MD-ERR 13
A6
74S02
7439
ER(00)
ER(01)
ER(02)
ER(03)
ER(04)
ER(05)
ER(06)
ER(07)
ER(08)
ER(09)
ER(10)
ER(11)
ER(12)
ER(13)
ER(14)
ER(15)
A7
A8
A13
A19
A42
BUS(00)
BUS(01)
BUS(02)
BUS(03)
BUS(04)
BUS(05)
BUS(06)
BUS(07)
BUS(08)
BUS(09)
BUS(10)
BUS(11)
BUS(12)
BUS(13)
BUS(14)
BUS(15)
7438
Data Code 8
R3
+5V
74H00
RM(32) 116
RM(33) 117
RM(34) 118
RM(35) 119
RM(36) 120
RM(37) 121
RM(38) 122
A10
A11
RH(0)
RH(1)
RH(2)
RH(3)
RH(4)
RH(5)
VPUL 3
RP
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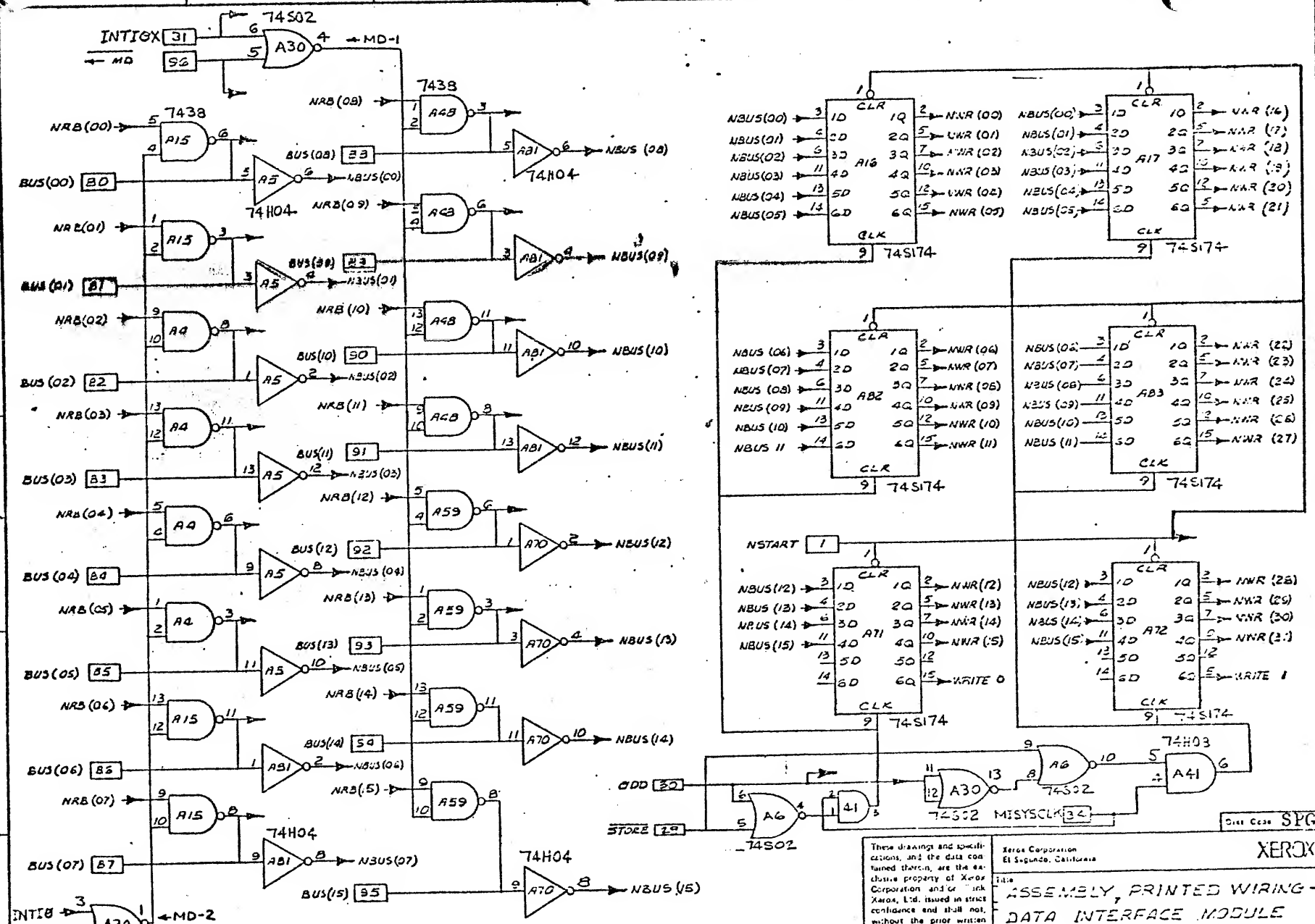
Title
ASSEMBLY, PRINTED WIRING
DATA INTERFACE MODULE
(EXTENDED MEMORY)
Code Ident. 13338
Size C
Dwg. No. 217174
Scale
Do Not Scale Drawing
Sheet 5



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Title: ASSEMBLY, PRINTED WIRING - DATA INTERFACE MODULE (EXTENDED MEMORY)	
Code Ident. 18338	Size C
Dwg. No. 217174	Rev C
Scale NONE	Do not Scale Drawing
Sheet 6	

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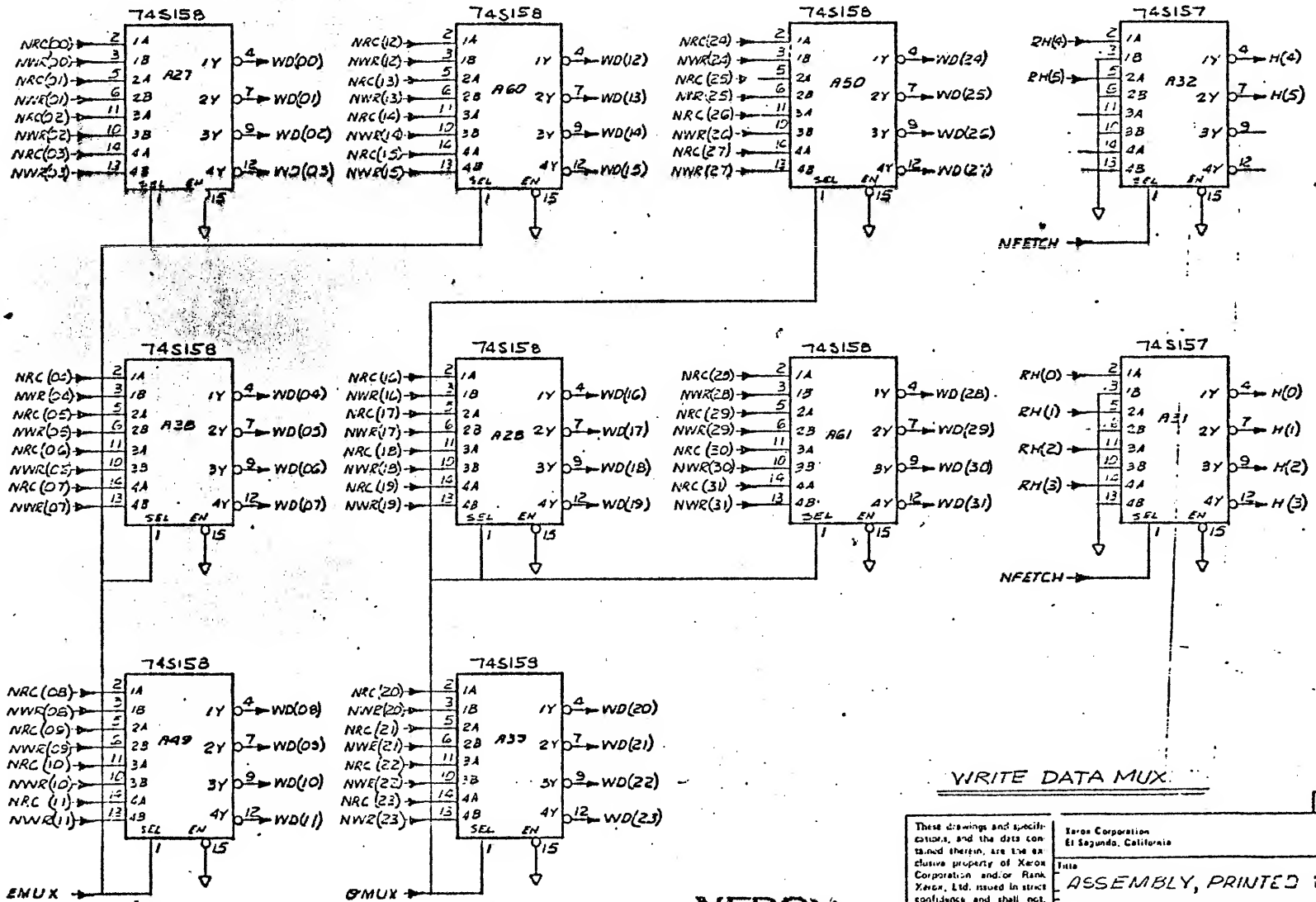

WRITE DATA MUX

Dwg. Code SPG

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Title: ASSEMBLY, PRINTED WIRING — DATA INTERFACE MODULE (EXTENDED MEMORY)

Code Ident.	Size	Dwg. No.	Change Letter
18338	C	217174	C

Scale: Do Not Scale Drawing | Sheet 7

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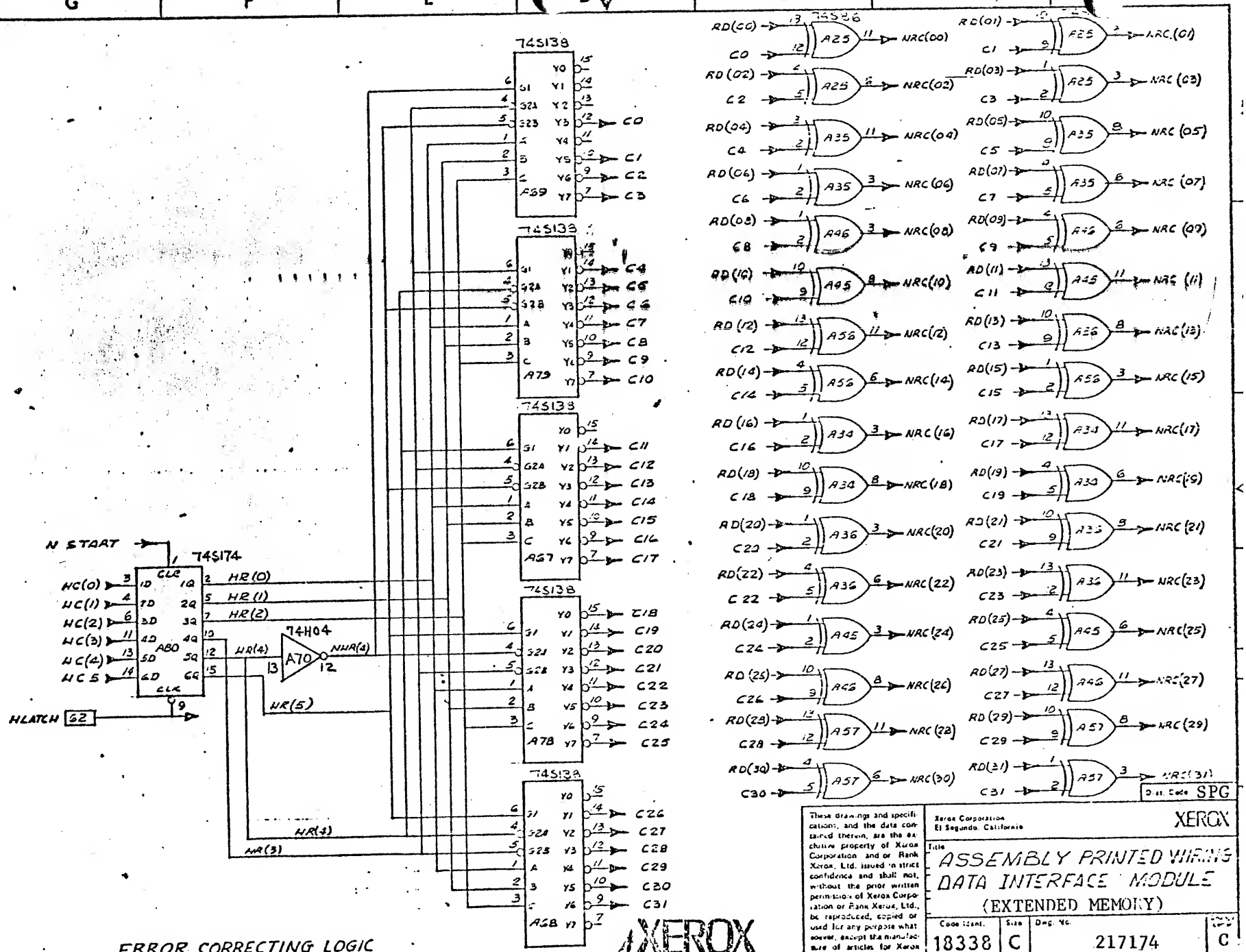

ERROR CORRECTING LOGIC

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Title
ASSEMBLY PRINTED WIRING
DATA INTERFACE MODULE
(EXTENDED MEMORY)

Code Ident.	Size	Dwg. No.	Rev.
18338	C	217174	C

Scale: Do Not Scale Drawing — Sheet 8

Dist. Code SPG

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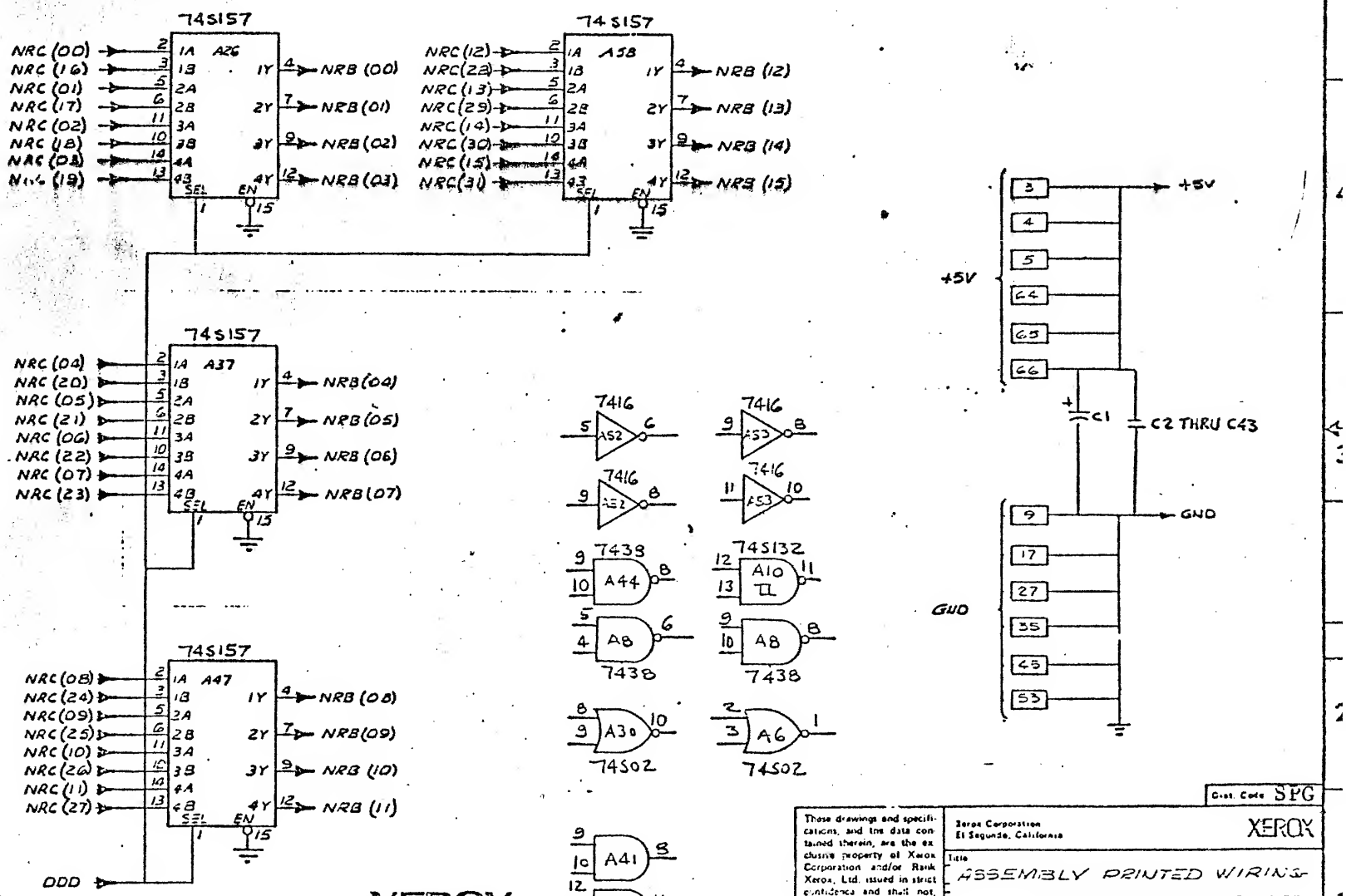

INPUT DATA MUX

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Cust. Code SPG

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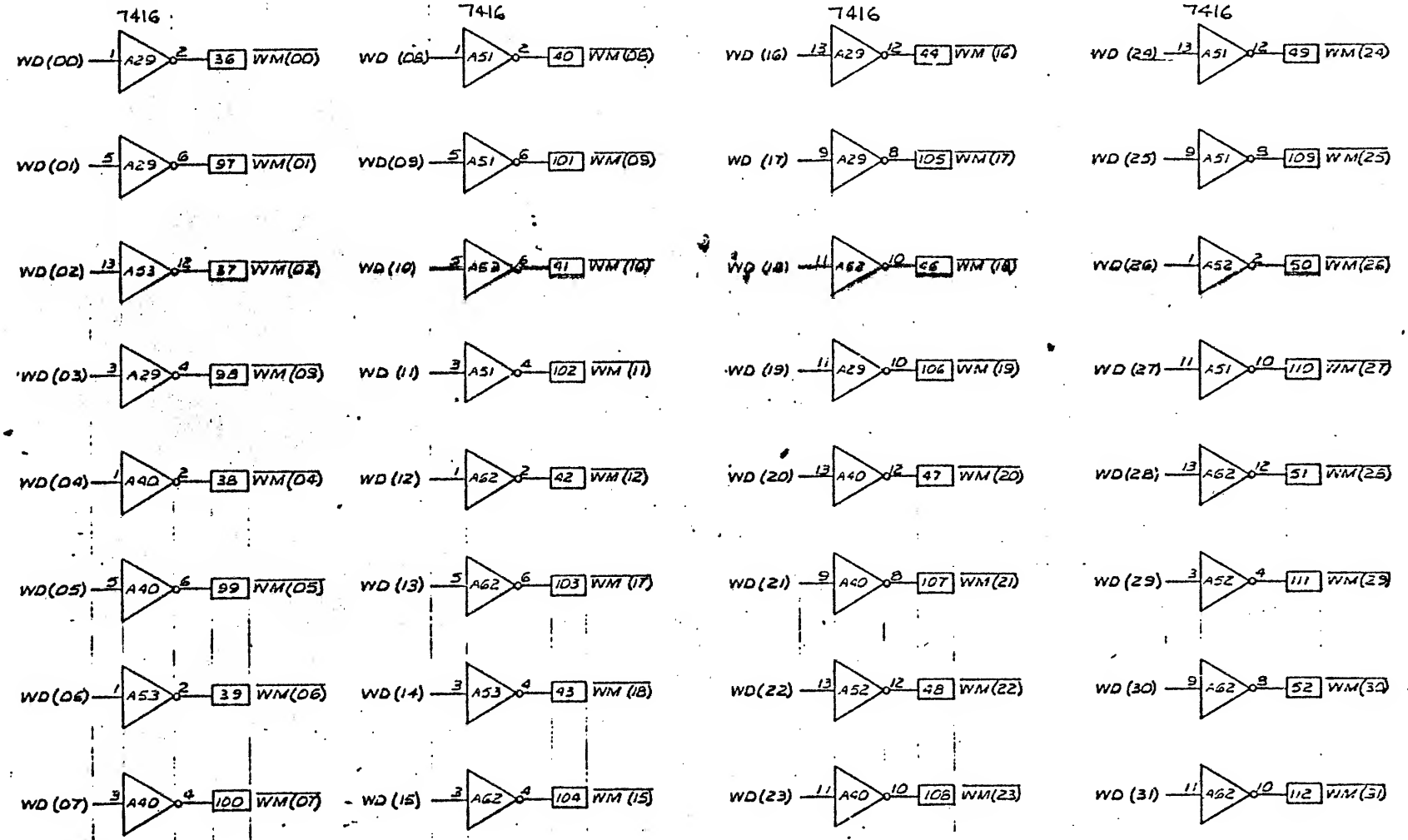
Title
ASSEMBLY PRINTED WIRING
DATA INTERFACE MODULE
(EXTENDED MEMORY)

Code Ident.	Size	Dwg No.	Rev
18338	C	1217174	C

Scale — Do Not Scale Drawing — Sheet 9



DATA OUTPUT

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Dist. Code SPG

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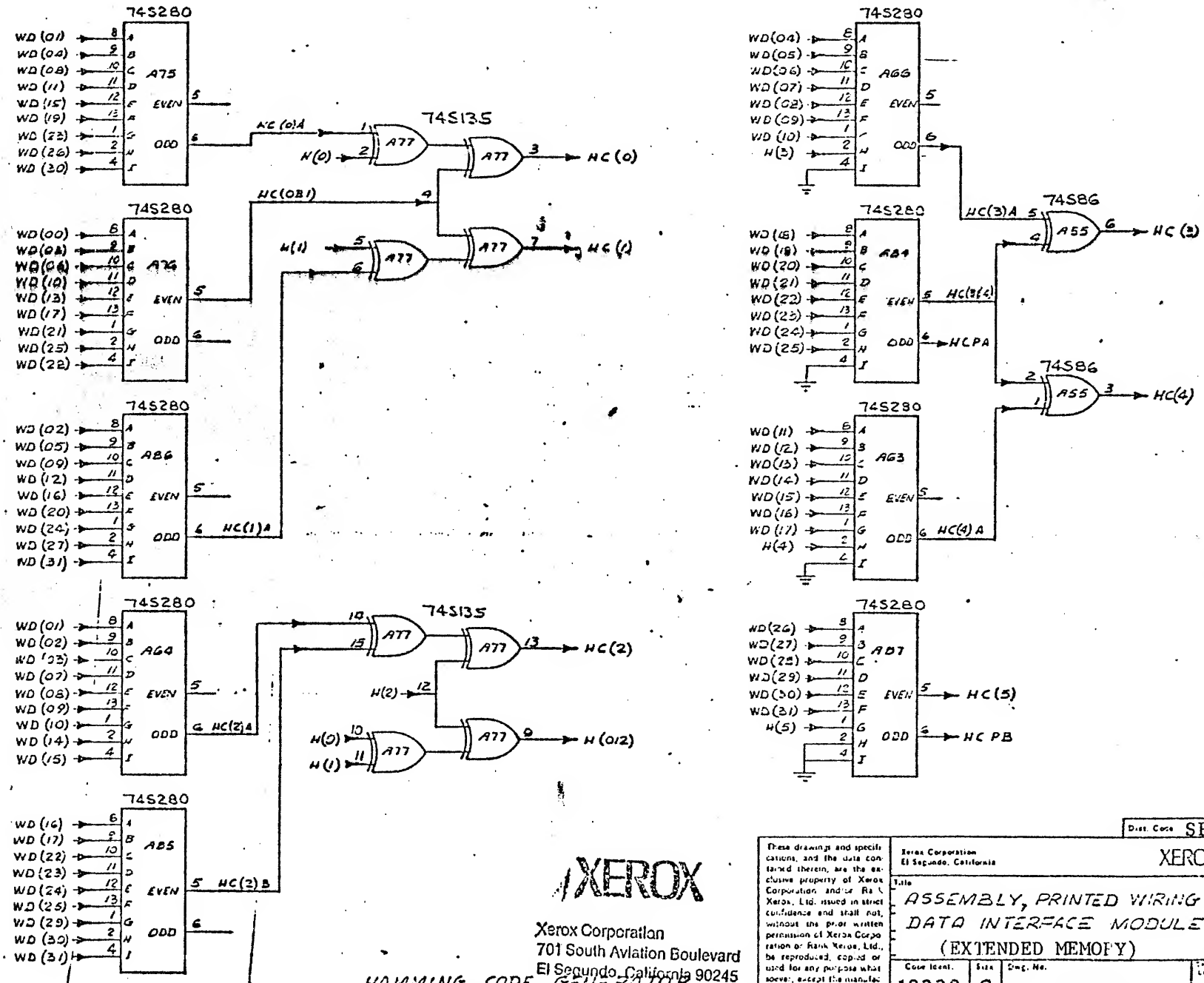
Title
ASSEMBLY PRINTED WIRING
DATA INTERFACE MODULE
(EXTENDED MEMORY)

Code Ident.	Size	Dwg No	Change Letter
18338	C	217174	C
Scale	Do Not Scale Drawing	Sheet 10	



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HAMMING CODE GENERATOR

Dist. Code SPG

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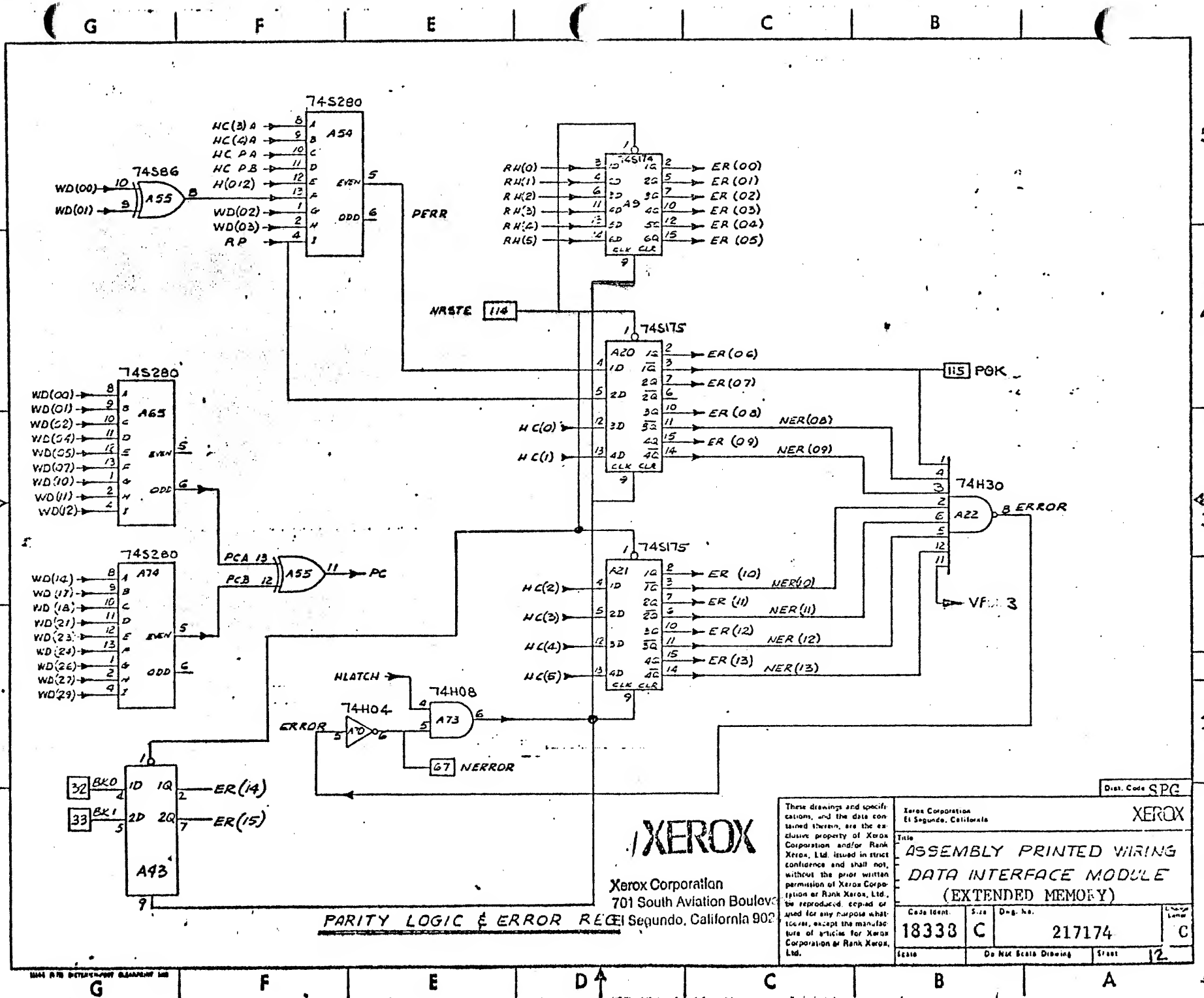
Title
ASSEMBLY, PRINTED WIRING - DATA INTERFACE MODULE (EXTENDED MEMORY)

Code Ident.	Size	Dwg. No.	Rev. Ltr.
18338	C	217174	C

Scale — Do Not Scale Drawing — Sheet 11


74S280
A54
MC(3) A
MC(4) A
MC P A
MC P B
H(012)
WD(02)
WD(03)
RP
EVEN
ODD
PERR
74S86
A55
WD(00)
WD(01)
74S174
A9
RH(0)
RH(1)
RH(2)
RH(3)
RH(4)
RH(5)
ER(00)
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ER(02)
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CLK
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114
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A20
ER(06)
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ER(08)
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MC(1)
NER(08)
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115
POK
74H30
A22
B ERROR
74S280
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WD(02)
WD(04)
WD(05)
WD(07)
WD(10)
WD(11)
WD(12)
74S280
A74
WD(14)
WD(17)
WD(18)
WD(21)
WD(23)
WD(24)
WD(26)
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A55
11
PC
74S175
A21
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MC(3)
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ER(11)
ER(12)
ER(13)
NER(10)
NER(11)
NER(12)
NER(13)
VFU 3
HLATCH
74H08
A73
74H04
A10
ERROR
67
NERROR
32
BK0
33
BK1
74S74
A93
1D
1Q
2D
2Q
ER(14)
ER(15)
PARITY LOGIC & ERROR REG
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Dist. Code SPG
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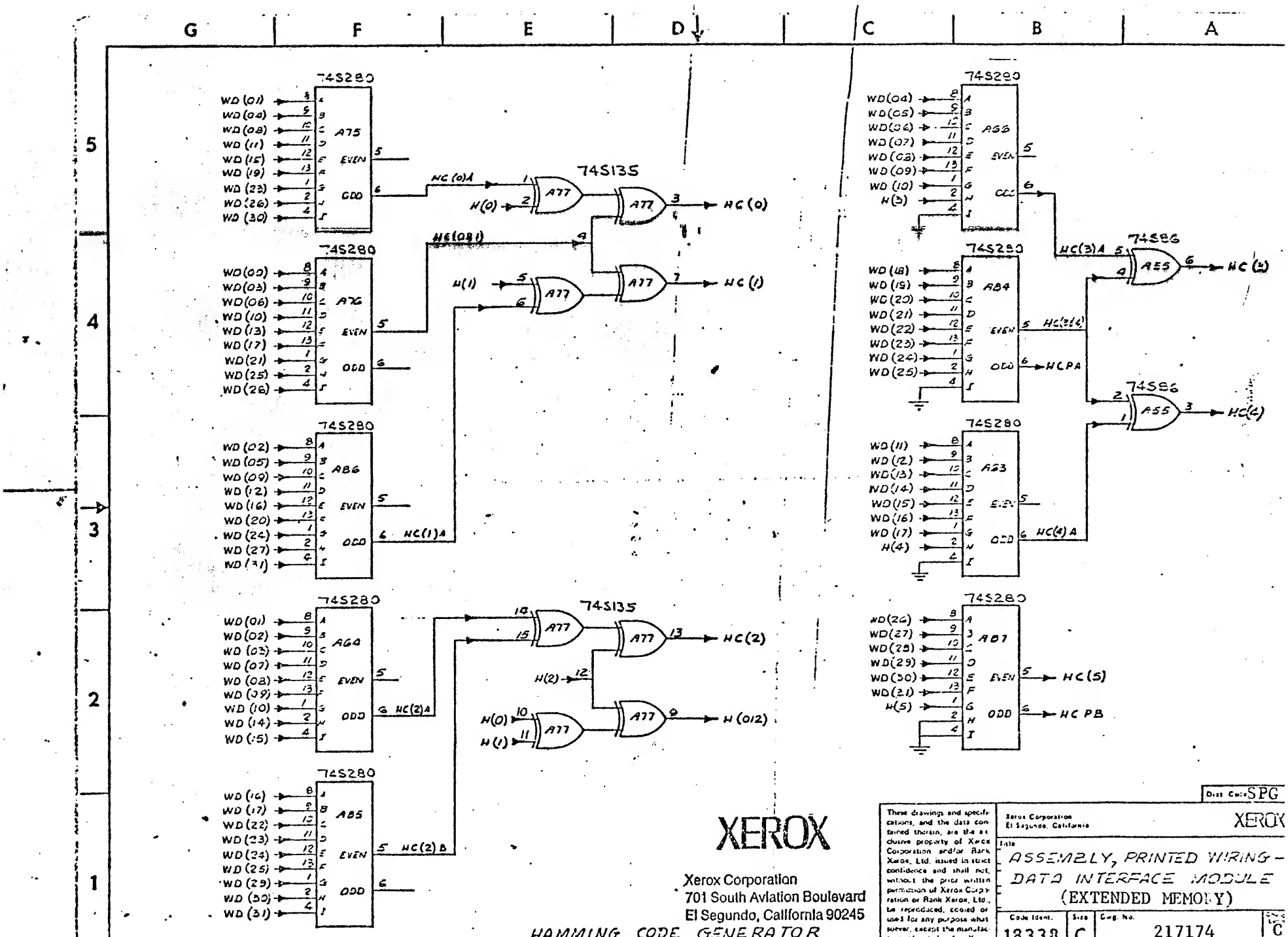
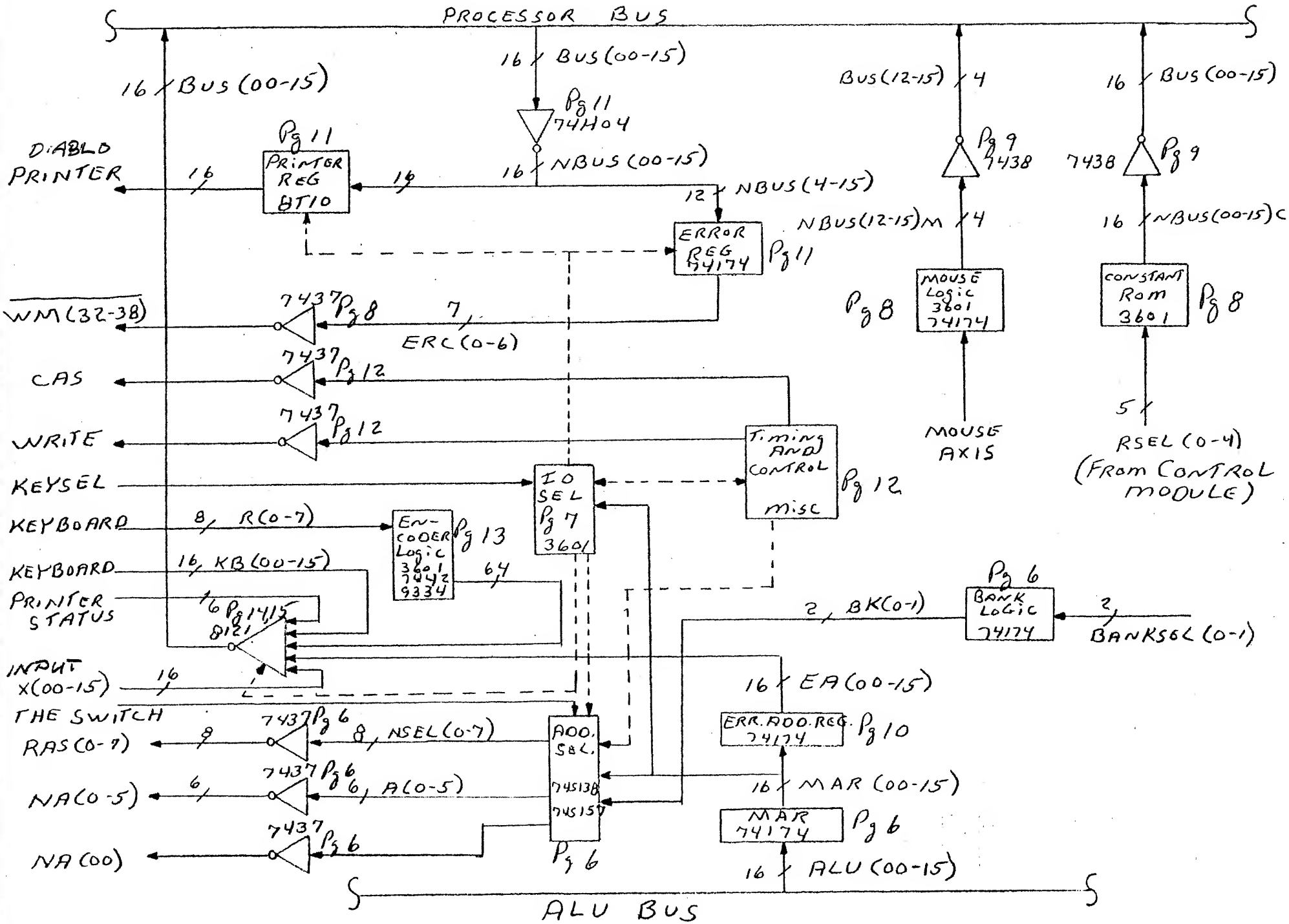
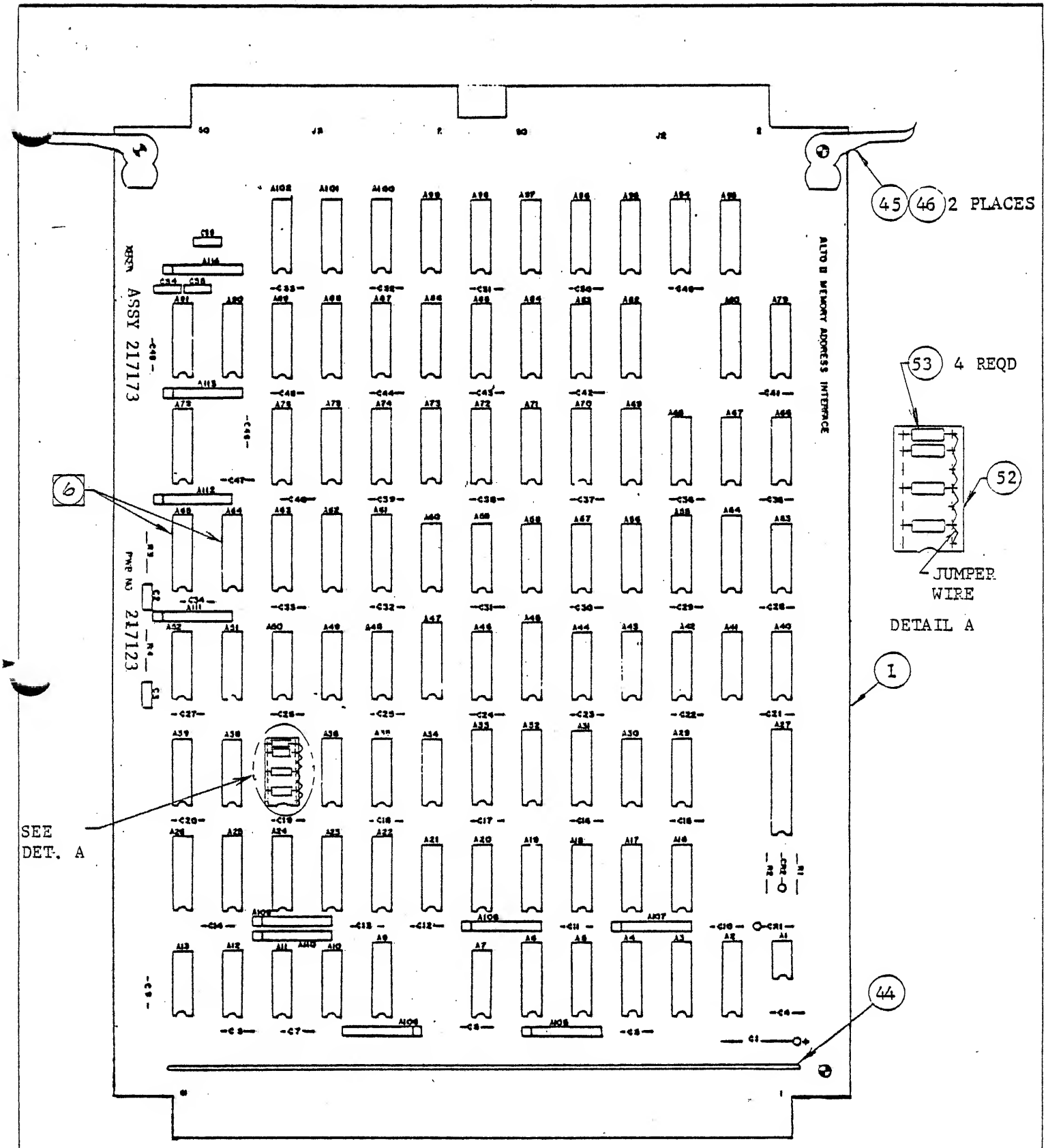
Title
ASSEMBLY PRINTED WIRING
DATA INTERFACE MODULE
(EXTENDED MEMORY)
Code Ident. 18333
Size C
Dwg. No. 217174
Level C
Scale
Do Not Scale Drawing
Sheet 12



EXTENDED MEMORY ADDRESS INTERFACE MODULE (AIM) (XM





Title

ASSEMBLY, PRINTED WIRING-
MEMORY ADDRESS INTERFACE
(EXTN MEM)

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217173 E

Sheet 3 Of

1536(1273)

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Material List

ML | Drawing No. 217173 | Rev. E

Drawing Title: ASSEMBLY, P.W. - MEMORY ADDRESS INTERFACE (EXTN MEM)

Rev. | Drawing No. 217173 | ML

Model No. ALTO II XM | Date 3/10/78 | Sheet 4 Of

Item No.	Drawing Title	Drawing No.	No. Req.	Remarks
1	Board, P.W.	217123	1	
2	Procedure, Test	216348	Ref.	
3	Spec, Module Assembly	216207	Ref	
4	Microcircuit 3601-1		9	A3 thru A6, A32, A64
				A65, A90, 91
5	7442		1	A78
6	9334		8	A69 thru A76
7	7438		7	A16 thru 20, 40, 53
8	7437		7	A10 thru 13, A35
				A36, 39
9	74H04		5	A57, 59, 66, 67, 68
10	74S04		1	A34
11	74H00		2	A50, 56
12	74S00		3	A30, 38, 44
13	74H21		1	A58
14	74H10		1	A29
15	74H08		2	A21, 60
16	74S138		1	A9
17	74164		1	A42
18	74174		11	A22,23,24,45,47,54,
				55,61,62,63,15
19	74279		2	A31,33
20	75451		1	A1
21	74S260		1	A43
22	74109		1	A2
23	7486		1	A7
24	8T10		4	A79,80,93,94
25	74S157		2	A25, A26
26	74S30		1	A48
27	74S02		2	A41,52
	7425		1	A49
29	Microcircuit 8121		16	A82 thru A89
				A95 thru A102

1068(3/73)

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XEROX

Material List

ML | Drawing No. 217173 | Rev E

Drawing Title: ASSEMBLY, P.W. -

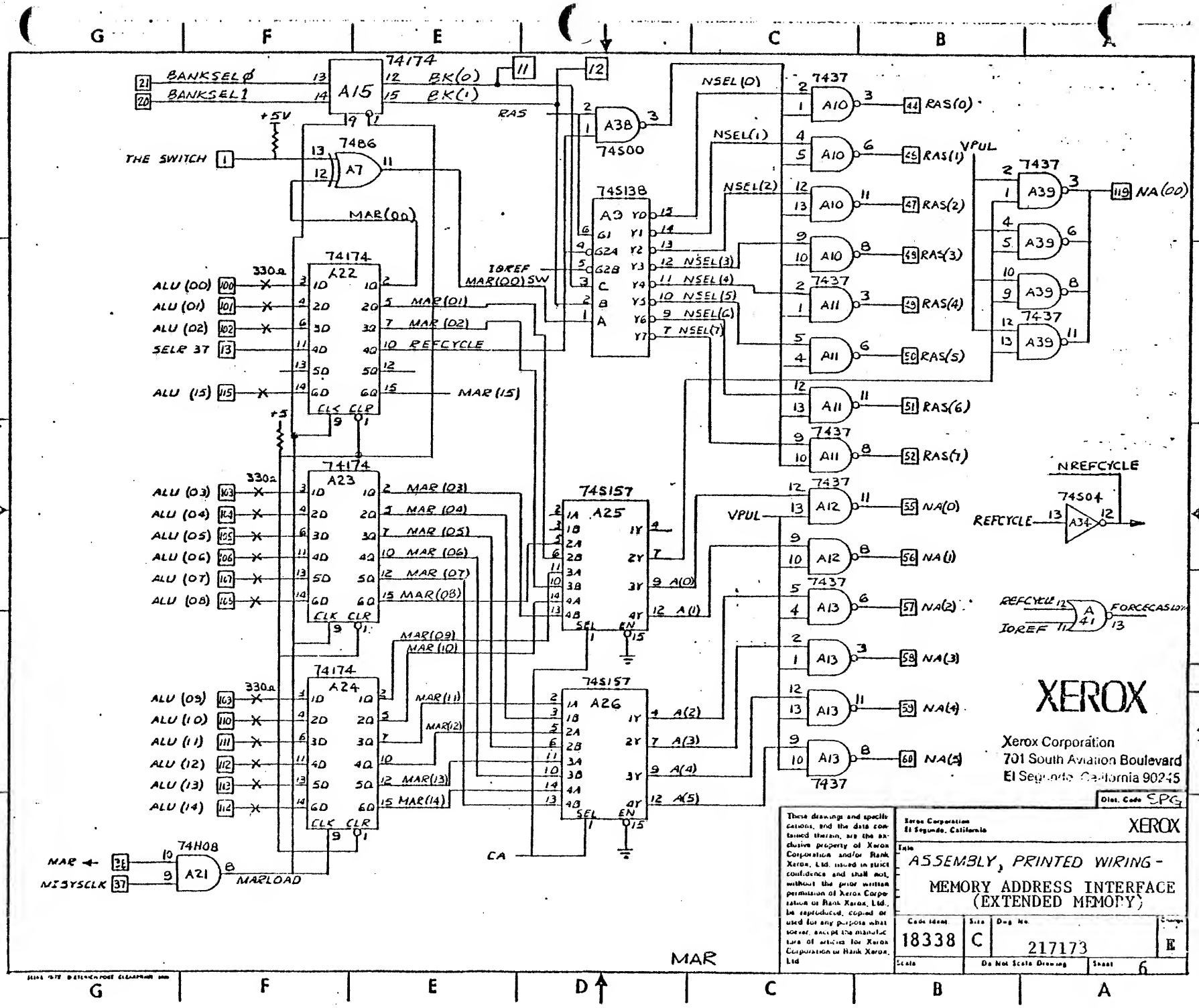
MEMORY ADDRESS INTERFACE (EXTN MEM)

Model No. ALTO II XM | Date 3/10/78 | Sheet 5 of

Rev | Drawing No. 217173 | ML

Item No.	Drawing Title	Drawing No.	No. Req.	Remarks
30	Microcircuit 74H74		1	A51
31	Microcircuit, Delay Line	168865-002	1	A27
32				
33	Resistor, Network, 330Ω ± 2%	(750-81-R330)	4	A106,109,110,92
34	Resistor, Network, 1K ± 2.5%, .16W	188600-007	7	A105,107,108,111
				A112, 113, 114
35	Resistor, Film, 100Ω ± 5%, 1/4W	116447-101	3	R2,3,4
36	Resistor, Film, 91 Ω ± 5%, 1/4W	116447-910	1	R1
37				
38	Diode, TN 123	111516	2	CR1, CR2
39				
40	Capacitor, Cer. .047μF ± 20%, 50V	159487-009	2	C2, C3
41	Capacitor, Tant. 22μF, ± 20%, 15V	187720-005	1	C1
42	Capacitor, Cer. .01μF, 50V	188483-001	50	C4 thru C53
43	Capacitor, Cer. .022μF, ±20%, 50V	159487-002	3	C54,55,56
44	Stiffener	216242	1	
45	Extractor	216250	2	
46	Rivet	156111-005	2	
47	Socket, Microcircuit 16 Pin	516-AG11D	54	
48	Socket, Microcircuit 14 Pin	514-AG11D	39	
49	~~Socket, Microcircuit 8 Pin~~		~~1~~	
50	~~Socket, Microcircuit 22 Pin~~		~~1~~	
51	Microcircuit 7432		1	A46
52	Adapter, Component (Inline Comp Co.#IP-1400)		1	(5)
53	Capacitor, 820 PF	184344-011	4	(5)

106B(3/73)


BANKSEL0
BANKSEL1
74174
A15
BK(0)
BK(1)
+5V
THE SWITCH
7486
A7
MAR(00)
74174
A22
ALU (00)
ALU (01)
ALU (02)
SELR 37
ALU (15)
330Ω
MAR(01)
MAR(02)
REFCYCLE
MAR(15)
74174
A23
ALU (03)
ALU (04)
ALU (05)
ALU (06)
ALU (07)
ALU (08)
MAR(03)
MAR(04)
MAR(05)
MAR(06)
MAR(07)
MAR(08)
74174
A24
ALU (09)
ALU (10)
ALU (11)
ALU (12)
ALU (13)
ALU (14)
MAR(09)
MAR(10)
MAR(11)
MAR(12)
MAR(13)
MAR(14)
74H08
A21
MAR
MISYSCLK
MARLOAD
RAS
A38
74S00
IOREF
MAR(00)SW
74S138
A3
NSEL(0)
NSEL(1)
NSEL(2)
NSEL(3)
NSEL(4)
NSEL(5)
NSEL(6)
NSEL(7)
74S157
A25
A26
A(0)
A(1)
A(2)
A(3)
A(4)
A(5)
CA
7437
A10
A11
A12
A13
RAS(0)
RAS(1)
RAS(2)
RAS(3)
RAS(4)
RAS(5)
RAS(6)
RAS(7)
VPUL
A39
NA(00)
NA(0)
NA(1)
NA(2)
NA(3)
NA(4)
NA(5)
NREFCYCLE
74S04
A34
REFCYCLE
FORCECASLOW
IOREF
A41
MAR
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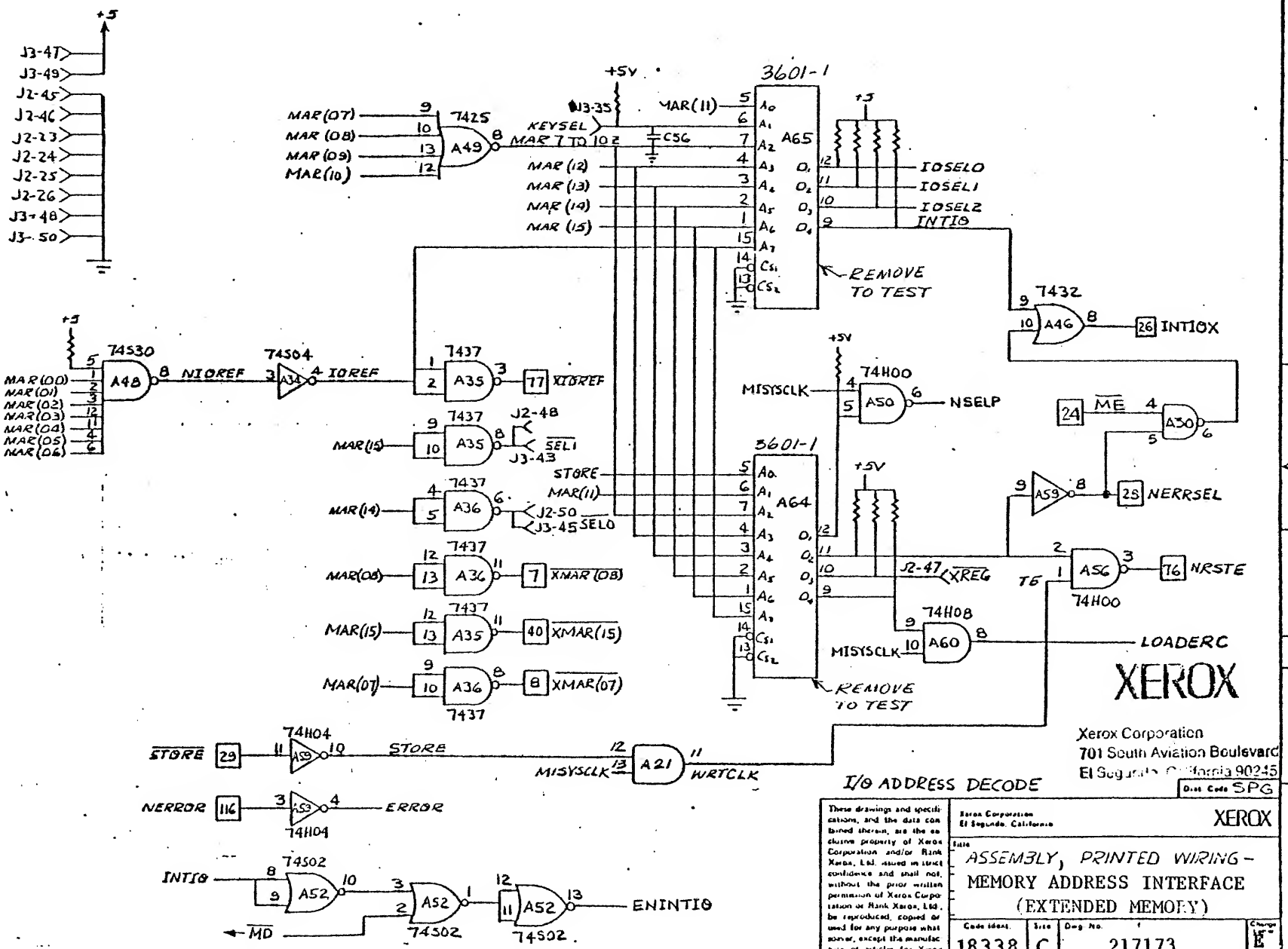
Title
ASSEMBLY, PRINTED WIRING -
MEMORY ADDRESS INTERFACE
(EXTENDED MEMORY)
Code Ident. 18338
Size C
Dwg No. 217173
Change E
Scale
Do Not Scale Drawing
Sheet 6


J3-47
J3-49
J2-45
J2-46
J2-23
J2-24
J2-25
J2-26
J3-48
J3-50
MAR(07)
MAR(08)
MAR(09)
MAR(10)
7425
A49
KEYSEL
MAR 7 TO 10 Z
C56
+5V
J3-35
3601-1
A65
MAR(11)
MAR(12)
MAR(13)
MAR(14)
MAR(15)
IOSELO
IOSEL1
IOSEL2
INTIO
REMOVE TO TEST
7432
A46
26 INTIOX
74S30
A48
MAR(00)
MAR(01)
MAR(02)
MAR(03)
MAR(04)
MAR(05)
MAR(06)
NIOREF
74S04
A34
IOREF
7437
A35
77 XIOREF
MAR(15)
J2-48
SEL1
J3-43
74H00
MISYSCLK
A50
NSELP
24 ME
A30
STORE
MAR(11)
3601-1
A64
J2-50
J3-45
SEL0
MAR(14)
A59
25 NERRSEL
MAR(08)
7 XMAR(08)
J2-47 XREG
T6
A56
76 NRSTE
74H08
A60
LOADERC
MAR(15)
40 XMAR(15)
MAR(07)
8 XMAR(07)
REMOVE TO TEST
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74H04
STORE
29
A39
STORE
A21
WRTCLK
I/O ADDRESS DECODE
NERROR
116
A53
ERROR
74S02
INTIO
A52
ENINTIO
MD
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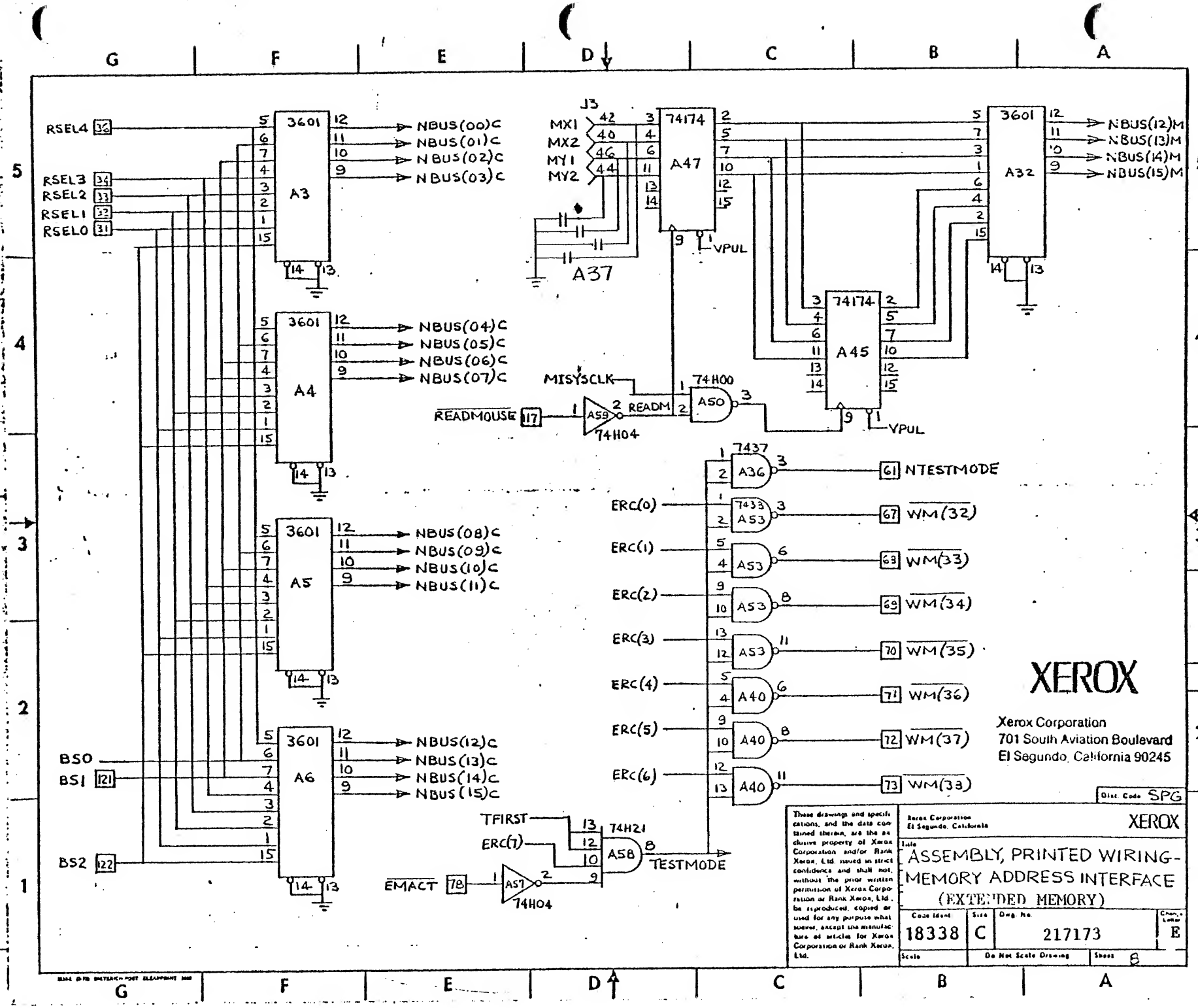
Dwg No. 217173
Change E
Scale
Do Not Scale Drawing
Sheet 7


RSEL4 36
RSEL3 34
RSEL2 33
RSEL1 32
RSEL0 31
3601
A3
NBUS(00)C
NBUS(01)C
NBUS(02)C
NBUS(03)C
A4
NBUS(04)C
NBUS(05)C
NBUS(06)C
NBUS(07)C
A5
NBUS(08)C
NBUS(09)C
NBUS(10)C
NBUS(11)C
A6
NBUS(12)C
NBUS(13)C
NBUS(14)C
NBUS(15)C
BS0
BS1 121
BS2 122
J3
MX1 42
MX2 40
MY1 46
MY2 44
A37
74174
A47
VPUL
A45
A32
NBUS(12)M
NBUS(13)M
NBUS(14)M
NBUS(15)M
MISYSCLK
READMOUSE 117
A59
74H04
READM
74H00
A50
7437
A36
61 NTESTMODE
ERC(0)
7433
A53
67 WM(32)
ERC(1)
63 WM(33)
ERC(2)
69 WM(34)
ERC(3)
70 WM(35)
ERC(4)
A40
71 WM(36)
ERC(5)
72 WM(37)
ERC(6)
73 WM(38)
TFIRST
ERC(7)
74H21
A58
TESTMODE
EMACT 78
A57
74H04
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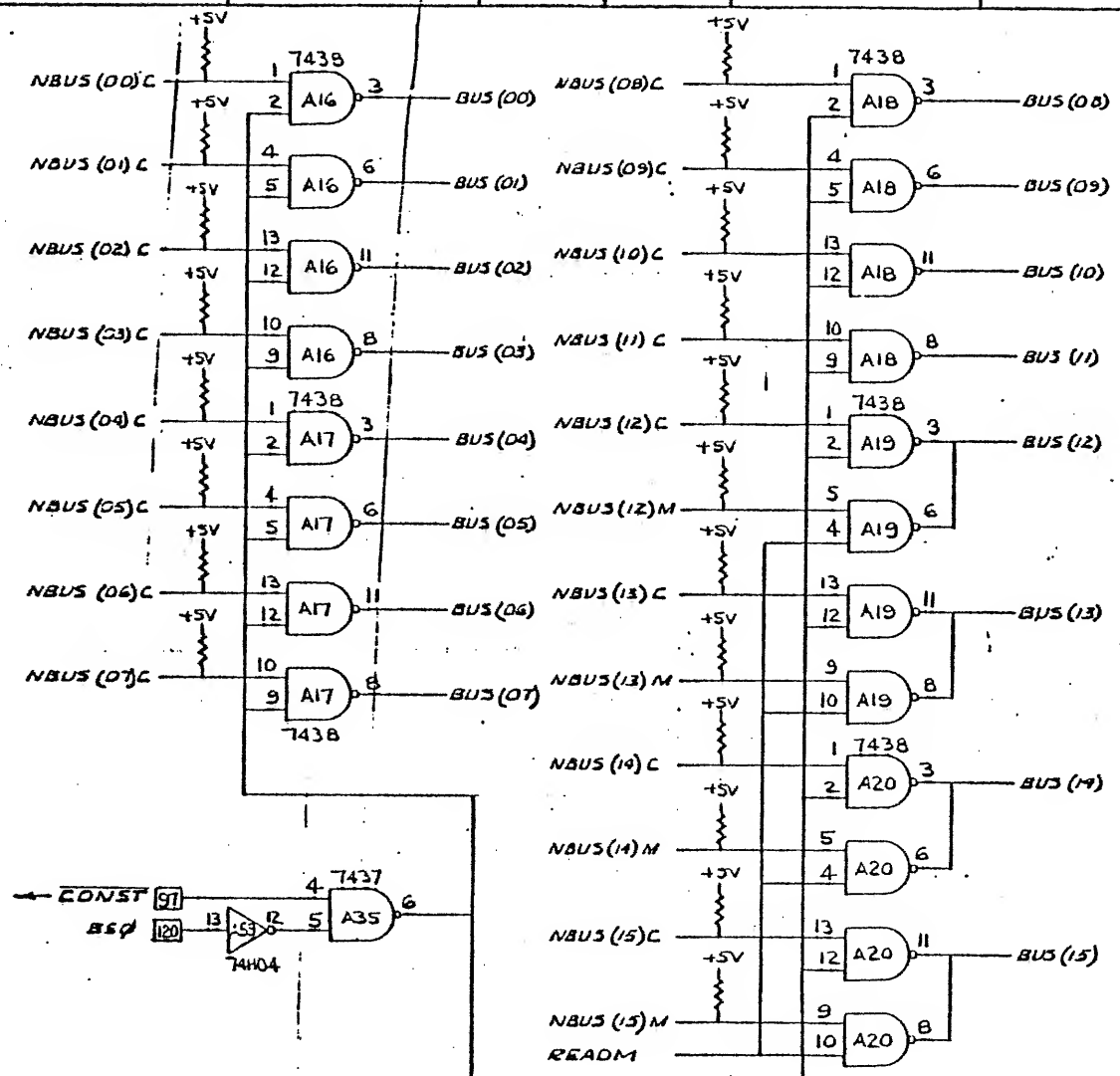
Size C
Dwg. No. 217173
Change Letter E
Scale
Do Not Scale Drawing
Sheet 8



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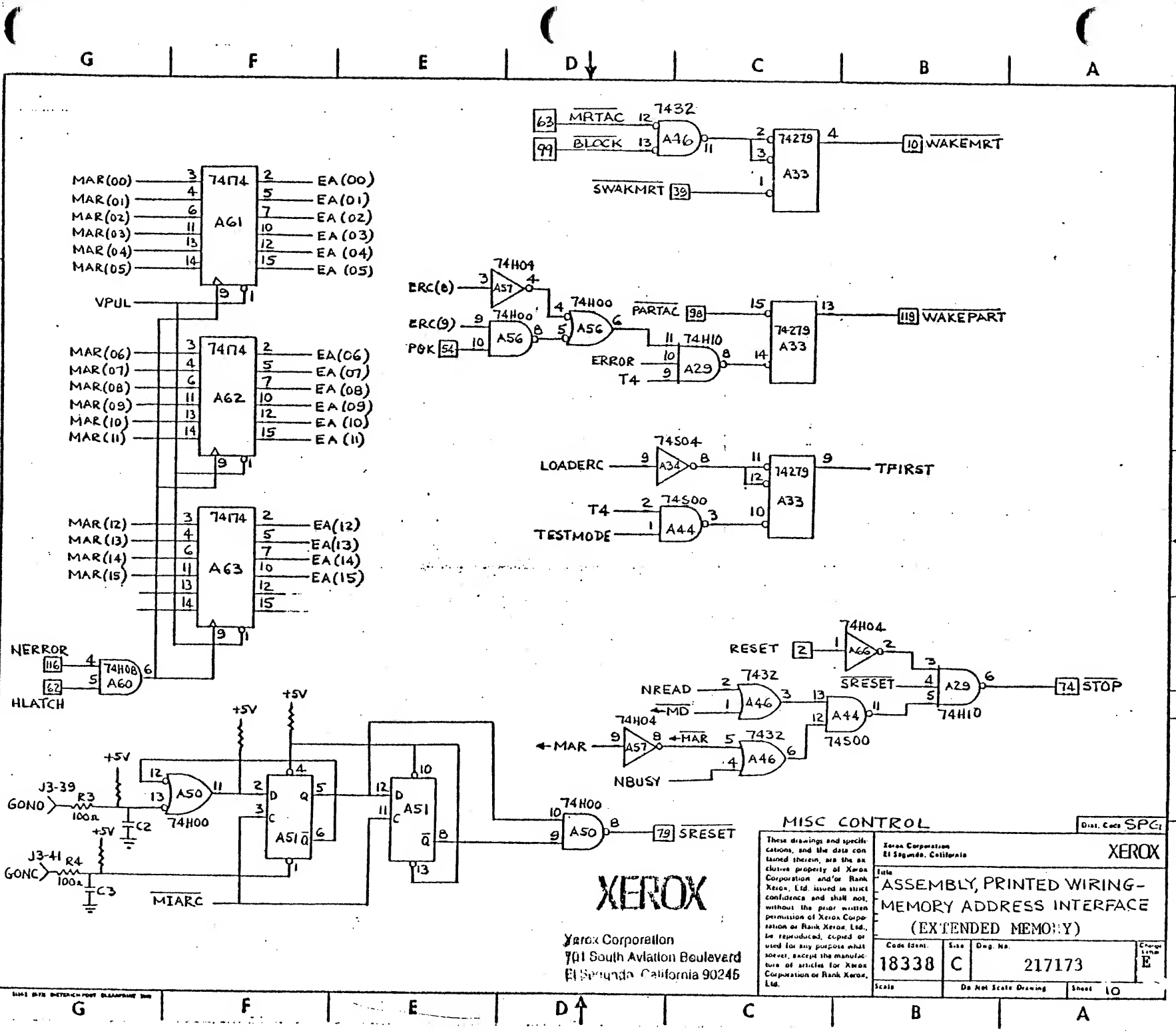
Code Ident.	Size	Dwg. No.	Change Letter
18338	C	217173	E

Scale — Do Not Scale Drawing — Sheet 9


MAR(00)
MAR(01)
MAR(02)
MAR(03)
MAR(04)
MAR(05)
74174
A61
EA(00)
EA(01)
EA(02)
EA(03)
EA(04)
EA(05)
VPUL
MAR(06)
MAR(07)
MAR(08)
MAR(09)
MAR(10)
MAR(11)
A62
EA(06)
EA(07)
EA(08)
EA(09)
EA(10)
EA(11)
MAR(12)
MAR(13)
MAR(14)
MAR(15)
A63
EA(12)
EA(13)
EA(14)
EA(15)
NERROR
116
62
HLATCH
74H08
A60
63
MRTAC
99
BLOCK
7432
A46
74279
A33
10
WAKEMRT
SWAKMRT
39
ERC(8)
ERC(9)
P0K
54
74H04
A57
74H00
A56
A56
PARTAC
98
74H10
A29
ERROR
T4
119
WAKEPART
LOADERC
74S04
A34
TFIRST
T4
TESTMODE
74S00
A44
RESET
2
A66
NREAD
MD
SRESET
74
STOP
MAR
HAR
NBUSY
+5V
J3-39
GONO
R3
100Ω
C2
J3-41
GONC
R4
C3
A50
A51
MIARC
79
SRESET
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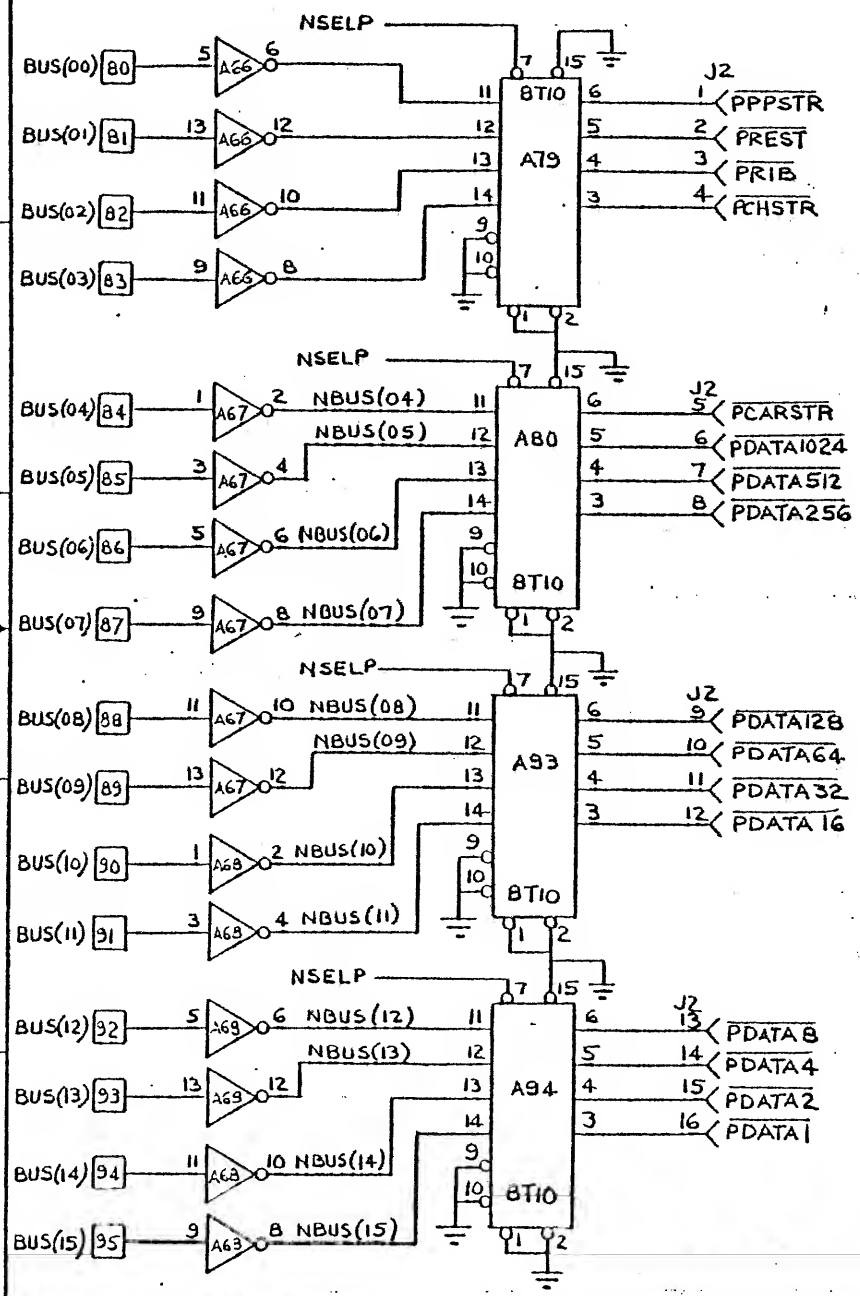
(EXTENDED MEMORY)
Code Ident. 18338
Size C
Dwg. No. 217173
Change Letter E
Scale
Do Not Scale Drawing
Sheet 10



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ERROR REGISTER

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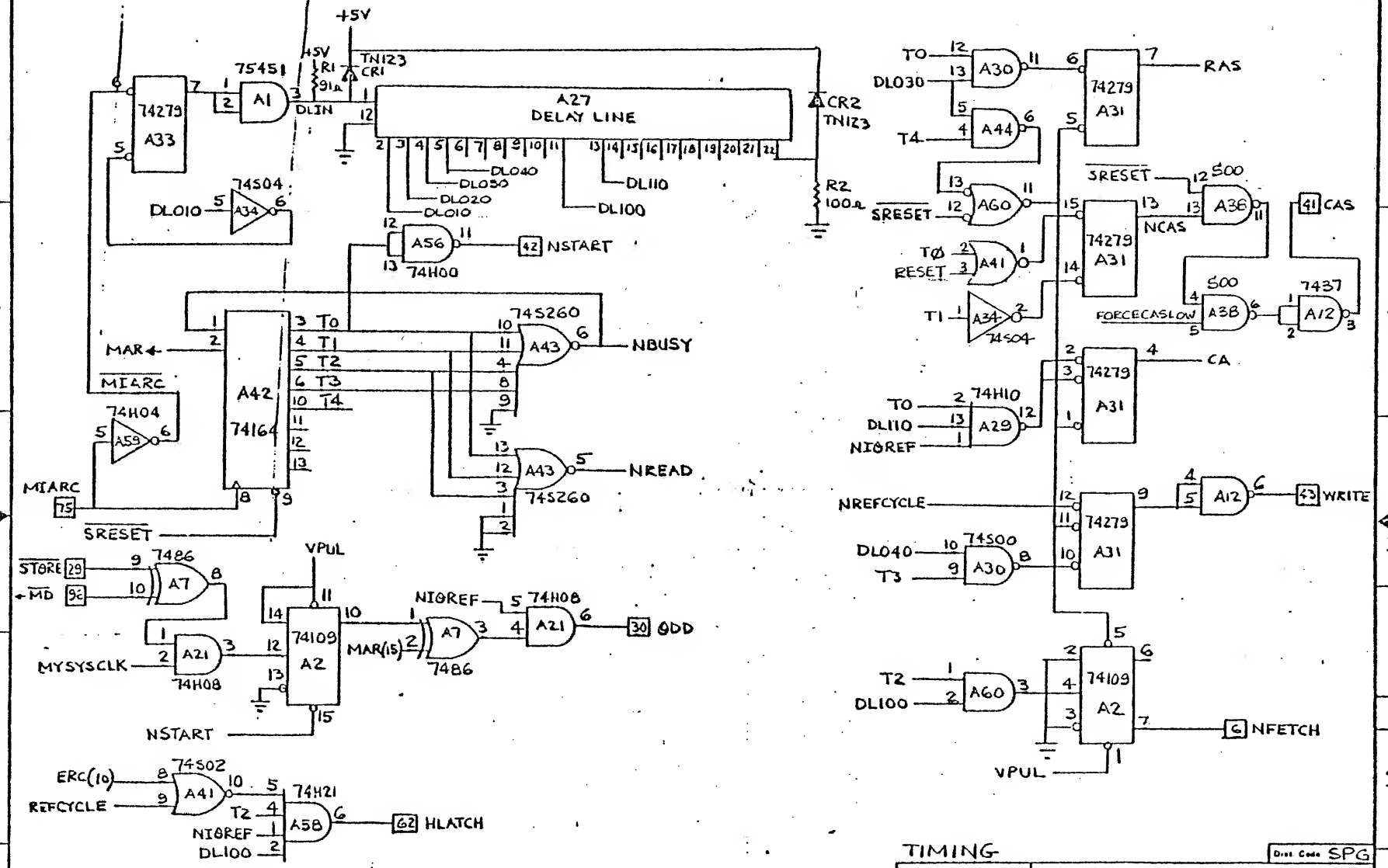
MEMORY ADDRESS INTERFACE
(EXTENDED MEMORY)

Code Ident.	Size	Dwg No.	Change Letter
18338	C	217173	E

Scale — Do Not Scale Drawing — Sheet 11


+5V
75451
A1
74279
A33
74S04
A34
DLO10
DLIN
A27
DELAY LINE
DLO40
DLO30
DLO20
DLO10
DLI10
DL100
CR1
TN123
CR2
TN123
R2
100Ω
A56
74H00
42 NSTART
MAR
MIARC
74H04
A59
A42
74164
T0
T1
T2
T3
T4
74S260
A43
NBUSY
NREAD
MIARC
75
SRESET
STORE 29
MD 98
74S86
A7
A21
74H08
MYSYSCLK
VPUL
74109
A2
NIOREF
MAR(15)
30 ODD
NSTART
ERC(10)
REFCYCLE
74S02
A41
74H21
A58
62 HLATCH
DLI00
TO
DLO30
T4
A30
A44
74279
A31
RAS
SRESET
A60
A36
NCAS
41 CAS
TØ
RESET
A41
T1
A34
74S04
FORCECASLOW
A38
7437
A12
CA
DLI10
NIOREF
74H10
A29
NREFCYCLE
WRITE
DLO40
T3
74S00
T2
DLI00
NFETCH
VPUL
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TIMING
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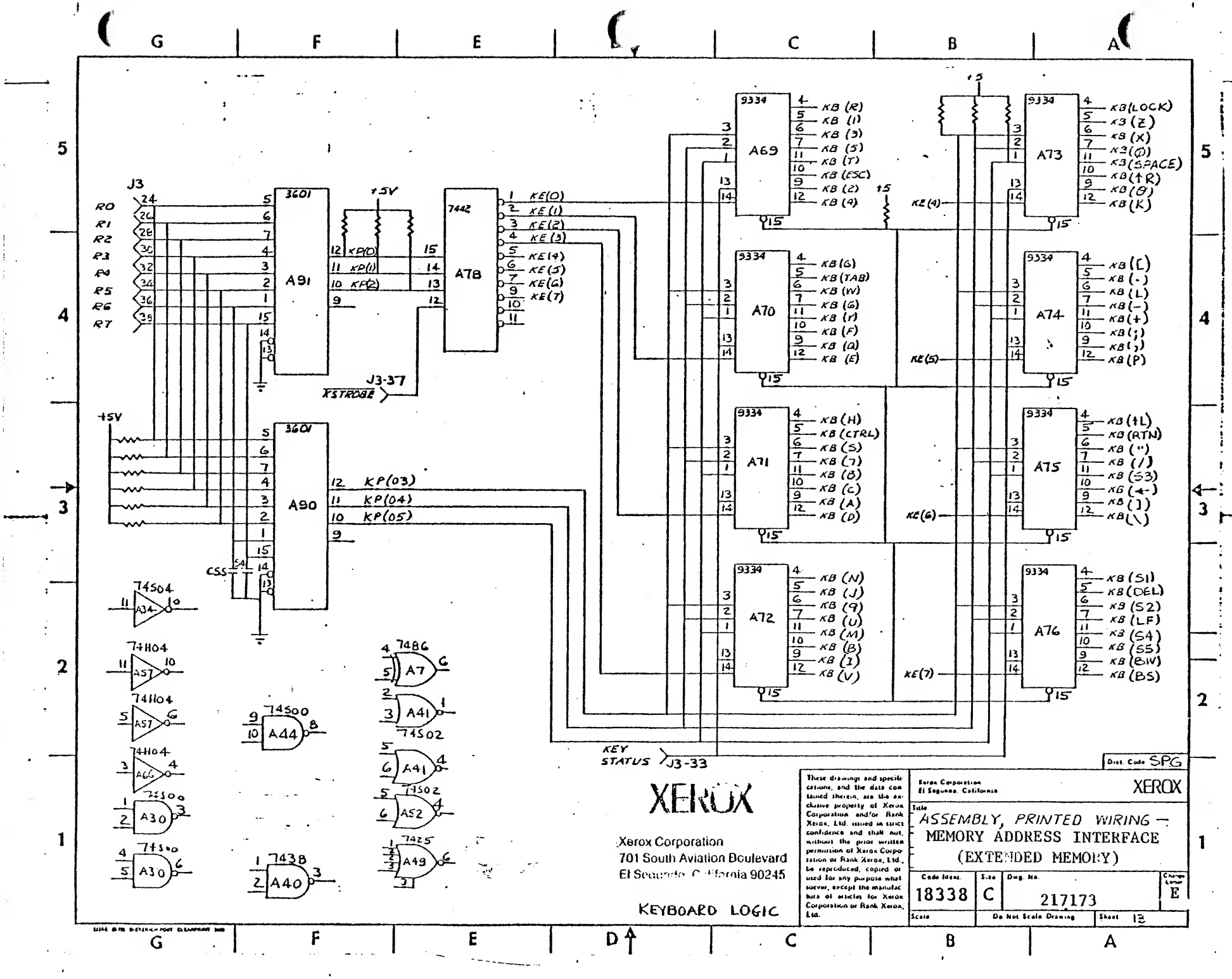
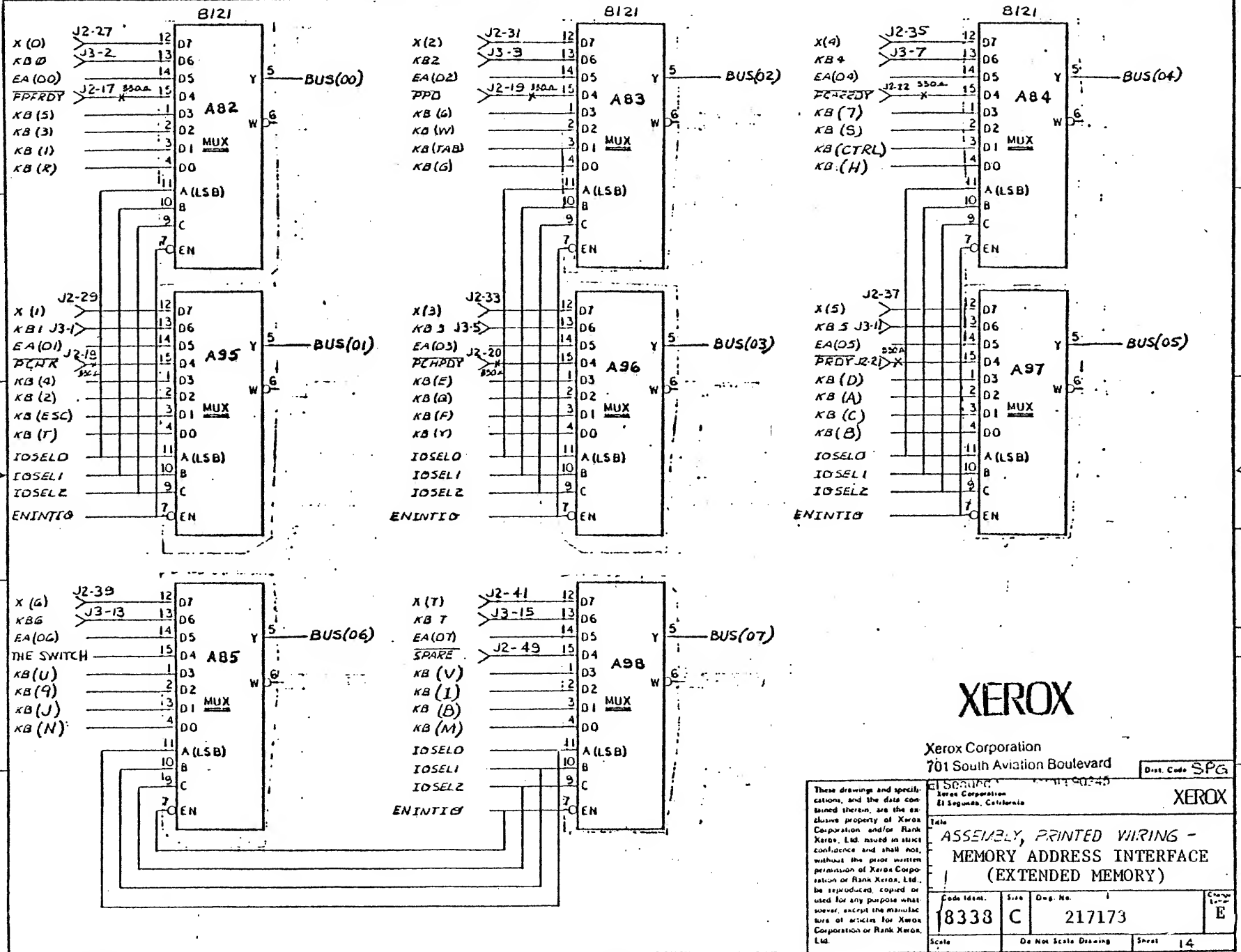
Code Ident. 18338
Size C
Dwg. No. 217173
Change Letter E
Scale
Do Not Scale Drawing
Sheet 12





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MEMORY ADDRESS INTERFACE
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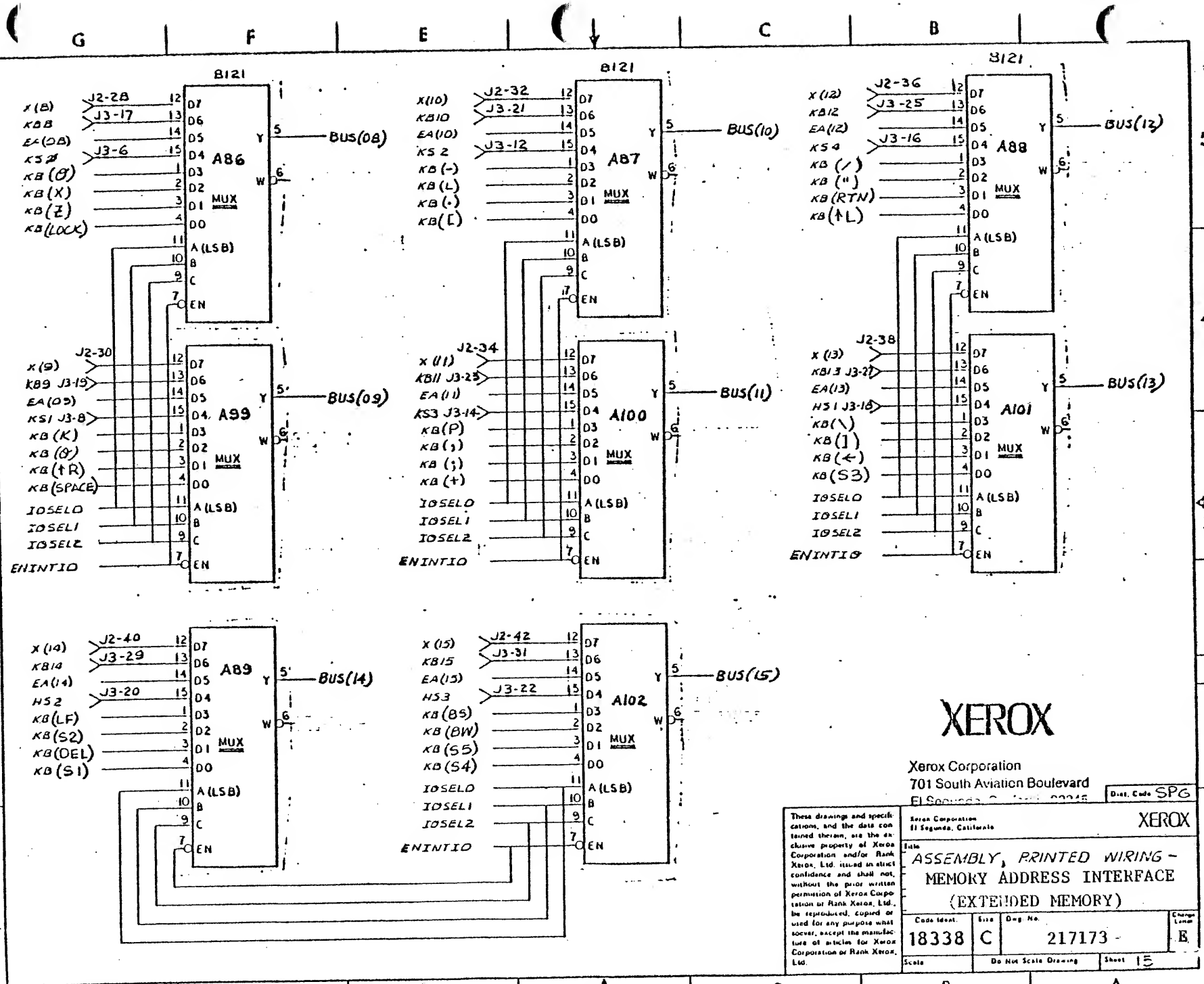
Code Ident.	Size	Dwg. No.	Change Letter
18338	C	217173	E

Scale — Do Not Scale Drawing — Sheet 14



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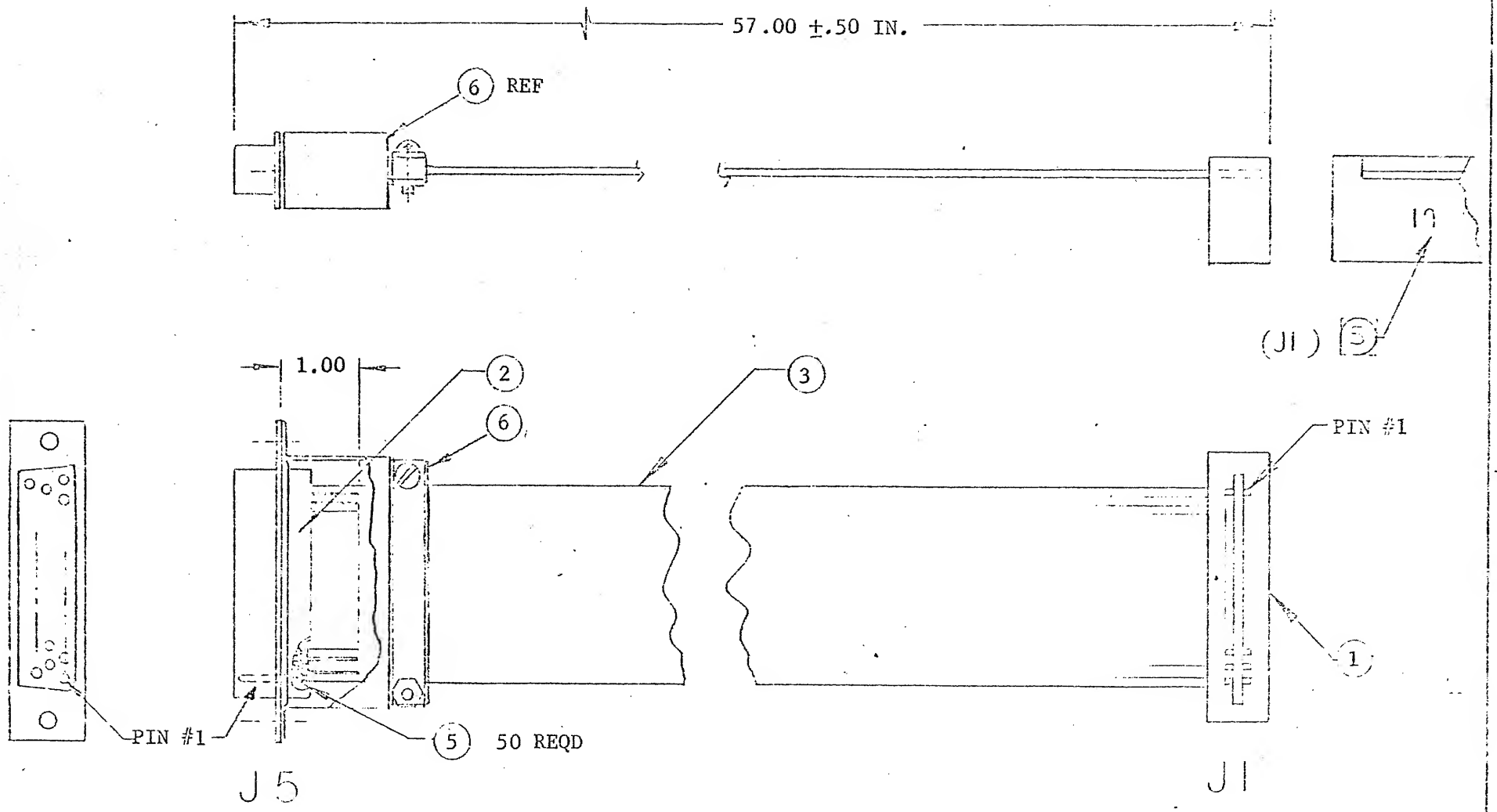
MEMORY ADDRESS INTERFACE
(EXTENDED MEMORY)

Code Ident.	Size	Dwg. No.	Change Letter
18338	C	217173 -	E

Scale — Do Not Scale Drawing — Sheet 15



Title

ALTO II

ASSEMBLY, CABLE - KEYBOARD

(INTERNAL)

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Sheet 3 of 6

A

Wire No.	Term	From	To	Term	Wire Type	Notes	Signal	Chg. Let.
1		J1 - 1	J5 -50		3		KB1	
2		2	17				KB0	
3		3	49				KB2	
4		4	33				SPARE	
5		5	16				KB3	
6		6	48				KS0	
7		7	32				KB4	
8		8	15				KS1	
9		9	47				KEY SLOT	
10		10	31				KEY SLOT	
11		11	14				KB5	
12		12	46				KS2	
13		13	30				KB6	
14		14	13				KS3	
15		15	45				KB7	
16		16	29				KS4	
17		17	12				KB8	
18		18	44				MS1	
19		19	28				KB9	
20		20	11				MS2	
21		21	43				KB10	
22		22	27				MS3	
23		23	10				KB11	
24		24	42				R0	
25		25	26				KB12	
26		J1 - 26	J5 - 9		3		R1	

1. Ref Item No's in Applicable Material List.
2. Ref Designations Are Abbreviated. Prefix Each Designation With:

Title ALTO II

ASSEMBLY, CABLE - KEYBOARD

(INTERNAL)

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Sheet 5 Of 6

Wire No.	Term	From	To	Term	Wire Type	Notes	Signal	Chg. Let.
27		J1 - 27	J5 -41		3		KB13	
28		28	25				R2	
29		29	8				KB14	
30		30	40				R3	
31		31	24				KB15	
32		32	7				R4	
33		33	39				KEYSTATUS	
34		34	23				R5	
35		35	6				KEYSEL	
36		36	38				R6	
37		37	22				$\overline{\text{KEYSTROBE}}$	
38		38	5				R7	
39		39	37				GONO	
40		40	21				MX2	
41		41	4				GONC	
42		42	36				MX1	
43		43	20				$\overline{\text{SEL1}}$	
44		44	3				MY2	
45		45	35				$\overline{\text{SEL0}}$	
46		46	19				MY1	
47		47	2				+5V	
48		48	34				GND	
49		49	18				+5V	
50		J1 - 50	J5 -1		3		GND	

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ASSEMBLY, CABLE - KEYBOARD (INTERNAL)

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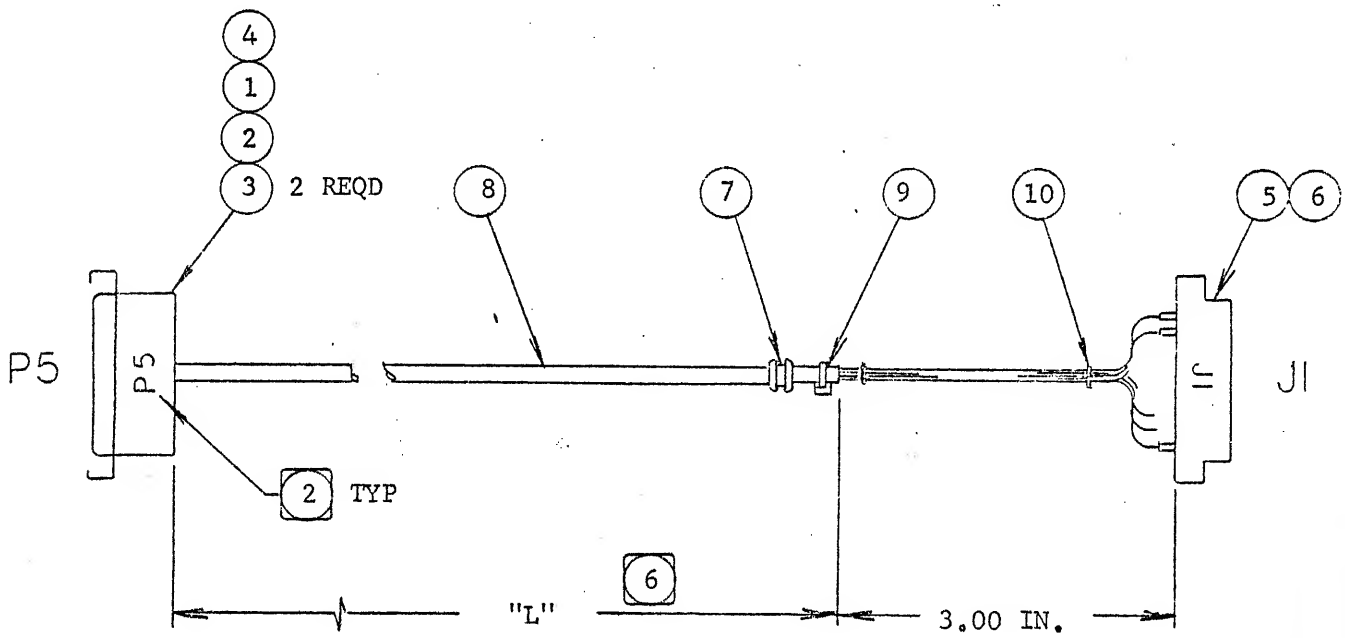
Sheet 6 Of 6



Title

ASSY, CABLE - KEYBOARD

(ALTO II/MICRO SW)

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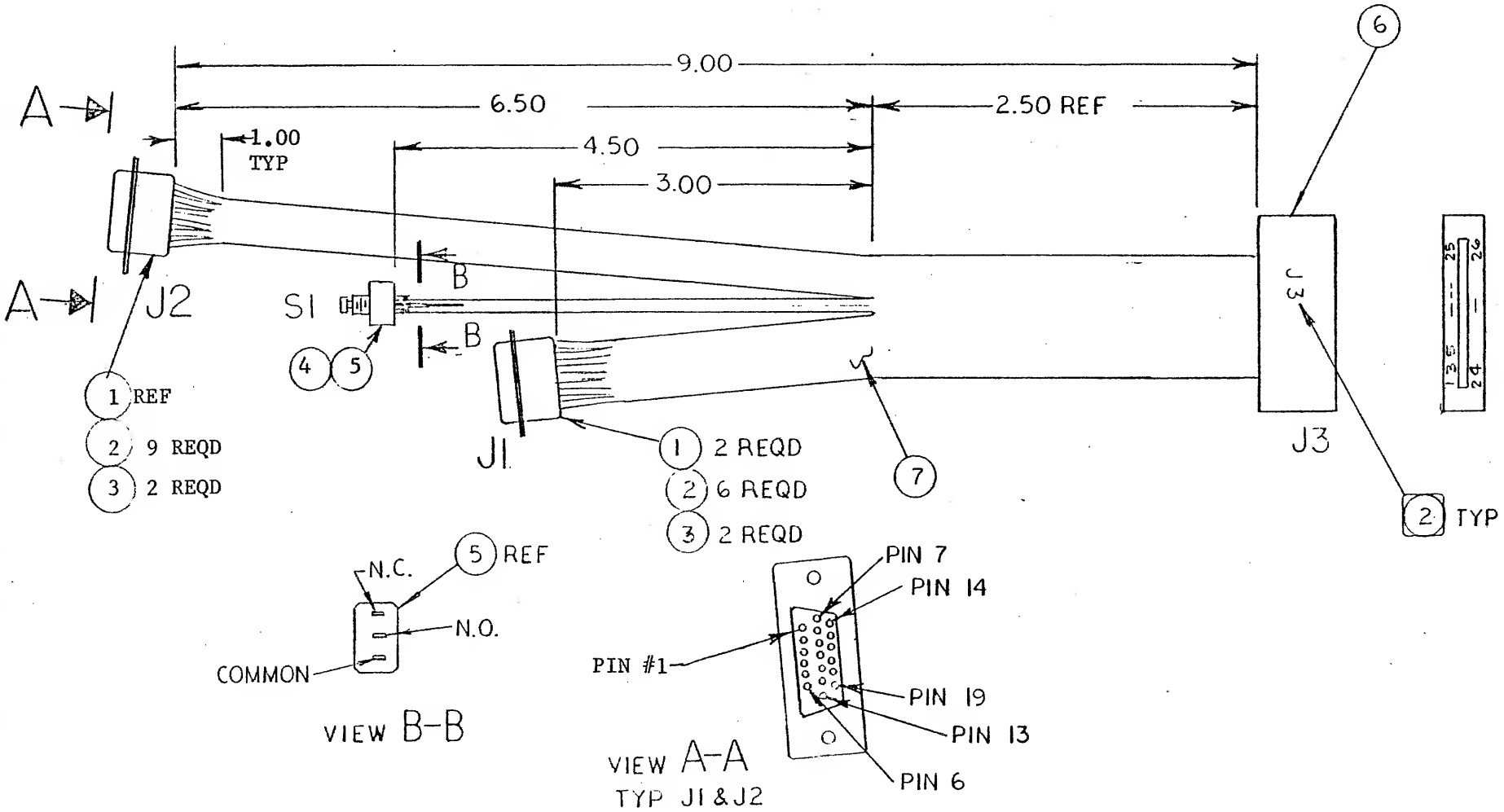
Sheet 3 Of 5

1586(3/73)

WIRE NO	TERM	FROM	TO	TERM	WIRE TYPE	NOTES	SIGNAL	CHG LET
1		P5-37	J1- 17			BLU/BLK	GONO	
2		17	B			PUR	KB0	
3		50	A			YEL/BLK	KB1	
4		49	1			BLU	KB2	
5		16	3			YEL/BRN	KB3	
6		32	C			GRN	KB4	
7		14	4			YEL/RED	KB5	
8		30	2			YEL	KB6	
9		45	D			YEL/ORG	KB7	
10		12	8			ORN	KB8	
11		28	J			YEL/GRN	KB9	
12		43	H			RED	KB10	
13		10	7			YEL/BLU	KB11	
14		26	E			BRN	KB12	
15		41	5			YEL/PUR	KB13	
16		8	F			BLK	KB14	
17		24	6			YEL/GRY	KB15	
18		35	K			WHT	SEL0'	
19		20	9			GRY	SEL1'	
20		48	14			ORN/BLK	KS0	
21		15	16			ORN/BRN	KS1	
22		46	S			ORN/RED	KS2	
23		13	15			ORN/BLU	KS3	
24		29	13			ORN/PUR	KS4	
25		44	Z			WHT/BLK	MS1	
26		11	25			WHT/BRN	MS2	
27		27	Y			WHT/RED	MS3	
28		36	X			WHT/ORN	MX2	
29		21	24			WHT/YEL	MX1	
30		19	23			WHT/GRN	MY1	
31		3	W			WHT/BLU	MY2	
32		4	T			BLU/BRN	GONC	
33		2	U			18 AWG WHT	+5V	
34		34	N			18 AWG BLK	GND	
35		18	V			GRN/ORN	+5V	
36		P5- 1	J1- P			PUR/WHT	GND	
37								
38								
39								
40								

217181

XEROX	PROJECT	ASSY,CABLE-KEYBD (ALTO II/MICROSW)	FILE KEYBRD-CA4	DESIGNER ED WAKIDA	REV A	DATE 3/3/78	PAGE 5 OF 5



Title

ALTO II

ASSEMBLY, CABLE - KEYBOARD (INTERNAL)

(ADL)

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216408 D

Sheet 3 Of 5

112(3/73)

Wire No.	Term	From	To	Term	Wire Type	Notes	Signal	Chg. Let.
1		J3 - 18	J2 - 11		7		KS0	
2		17	10				KS1	
3		20	9				KS2	
4		19	8				KS3	
5		22	J2 - 7				KS4	
6		4	J1 - 14				MS1	
7		3	16				MS2	
8		6	15				MS3	
9		5	1				MX1	
10		8	2				MX2	
11		7	3				MY1	
12		10	J1 - 4				MY2	
13		14	S1 - N.O.				GONC	
14		11	S1 - N.C.				GONO	
15		9	J1 - 6				+5 VDC	
16		2	J1 - 19				DC GND	
17		25	J2 - 19				DC GND	
18		J3 - 12	S1 - C		7			

1. Ref Item No's in Applicable Material List.
2. Ref Designations Are Abbreviated. Prefix Each Designation With:

Title ALTO II

ASSEMBLE, CABLE - KEYBOARD (INTERNAL)

(ADL)

Xerox Corporation
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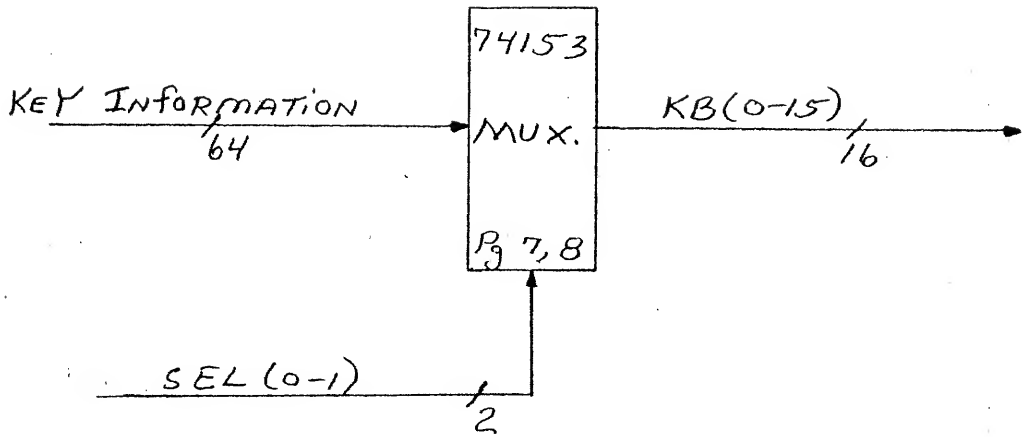
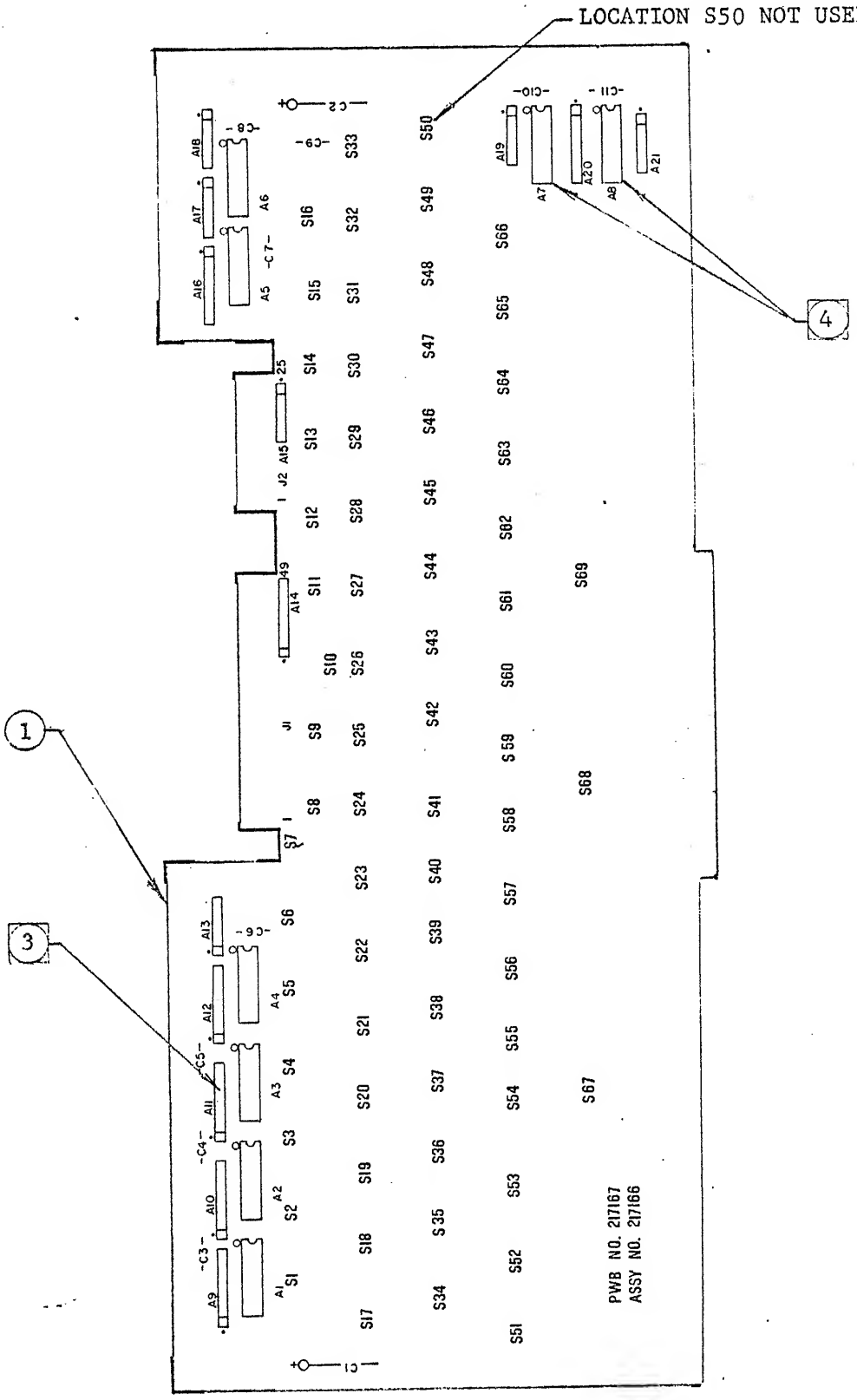
XEROX

216408 D

Sheet 5 Of 5

KEY BOARD BLOCK DIAGRAM





Title

ASSY, PRINTED WIRING-
KEYBOARD
(ALTO II/MICROSWITCH)

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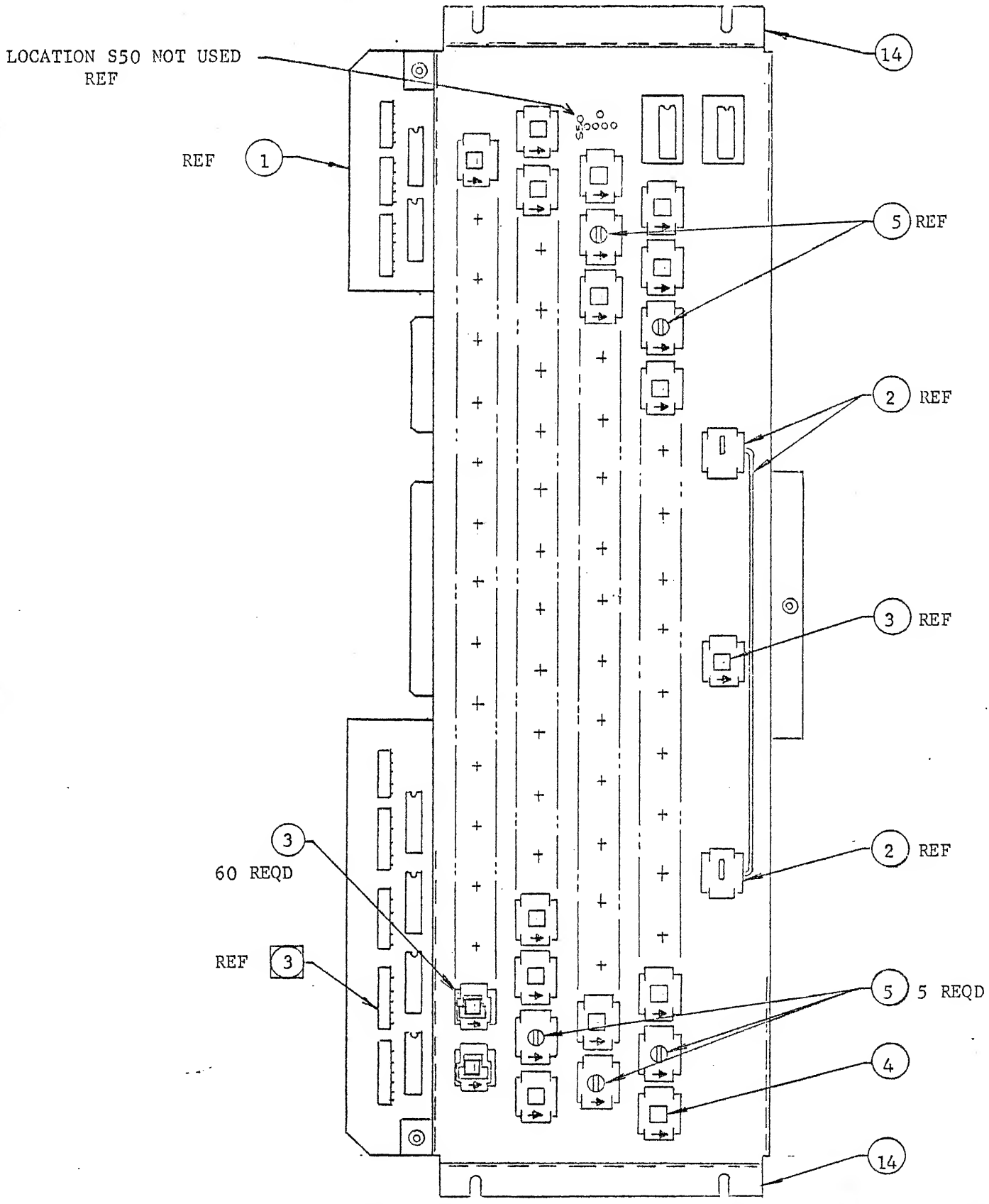
XEROX

217166 B

Sheet 3 Of 8

1586(3/73)



Title

ASSY, PRINTED WIRING-
KEYBOARD
(ALTO II/MICROSWITCH)

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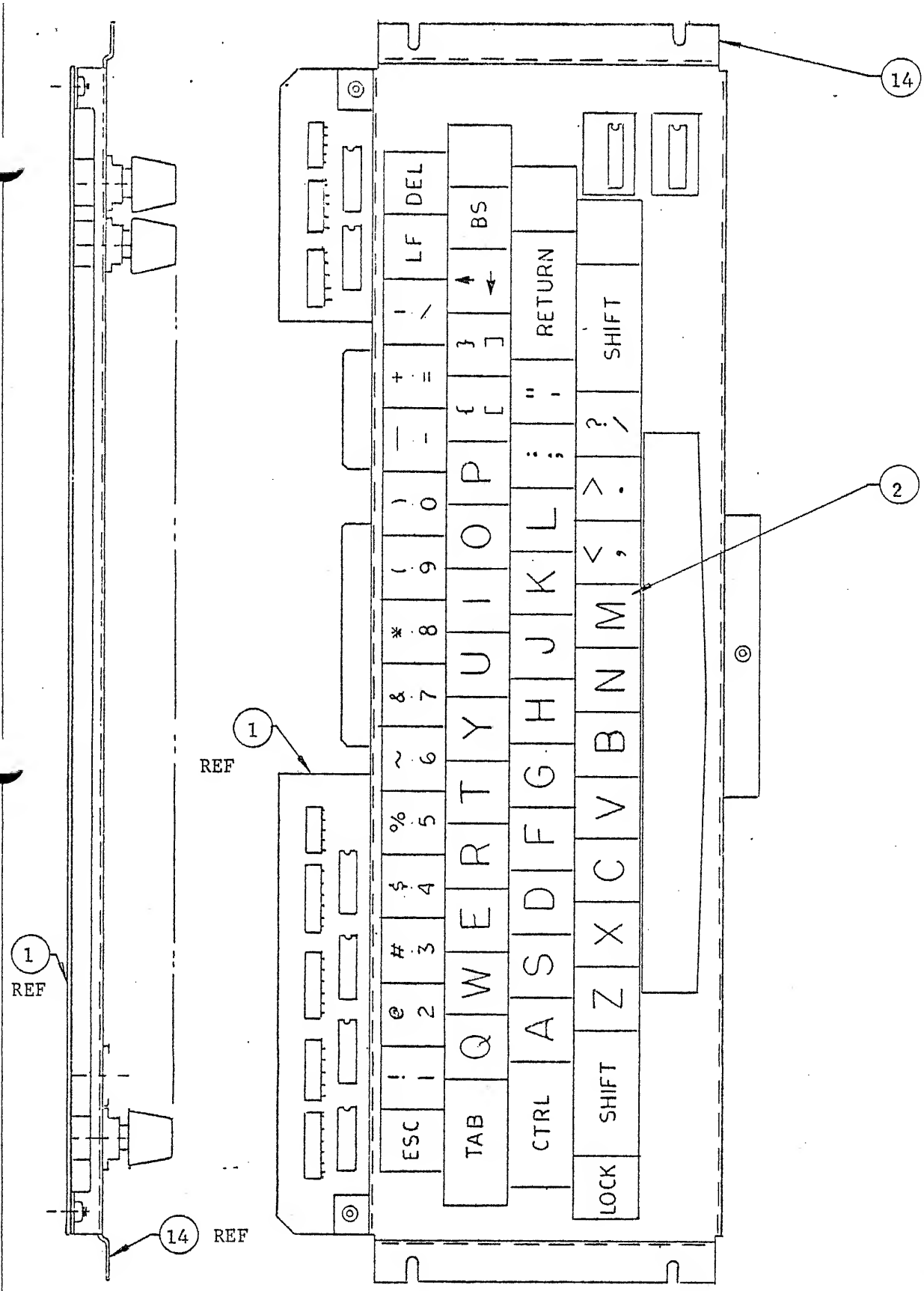
217166 B

Sheet 4 Of 8

1566(3-73)



Title

ASSY, PRINTED WIRING-
KEYBOARD

(ALTO II/MICROSWITCH)

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217166 B

Sheet 5 Of 8

1586(3-73)

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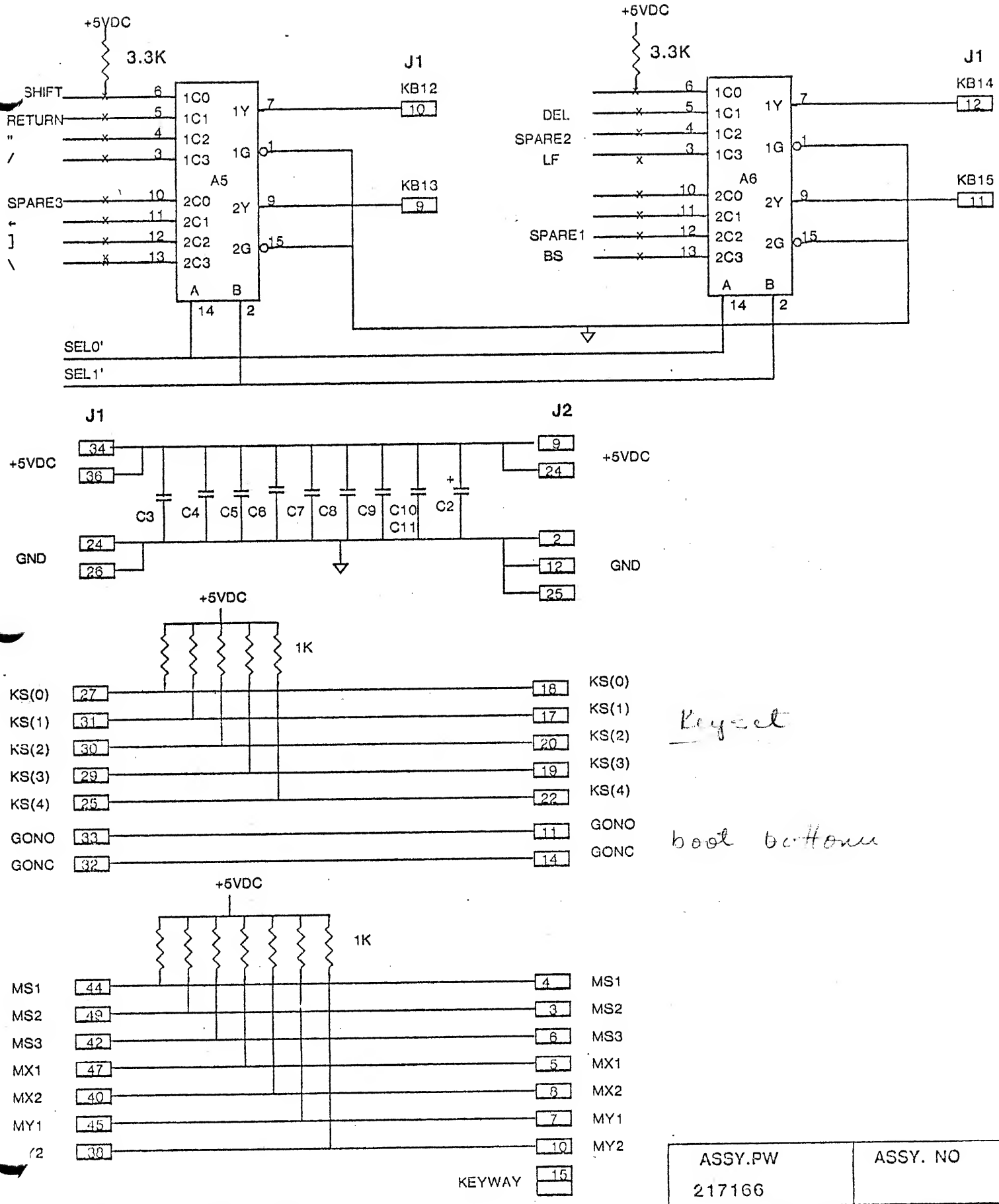
MATERIAL LIST keybrd-do4

ML	Drawing No.	Rev.
	217166	B

Rev.	Drawing Title	
B	ASSEMBLY, PW-KEYBOARD (ALTO II/MICROSW)	
Dwg. No. 2171166		

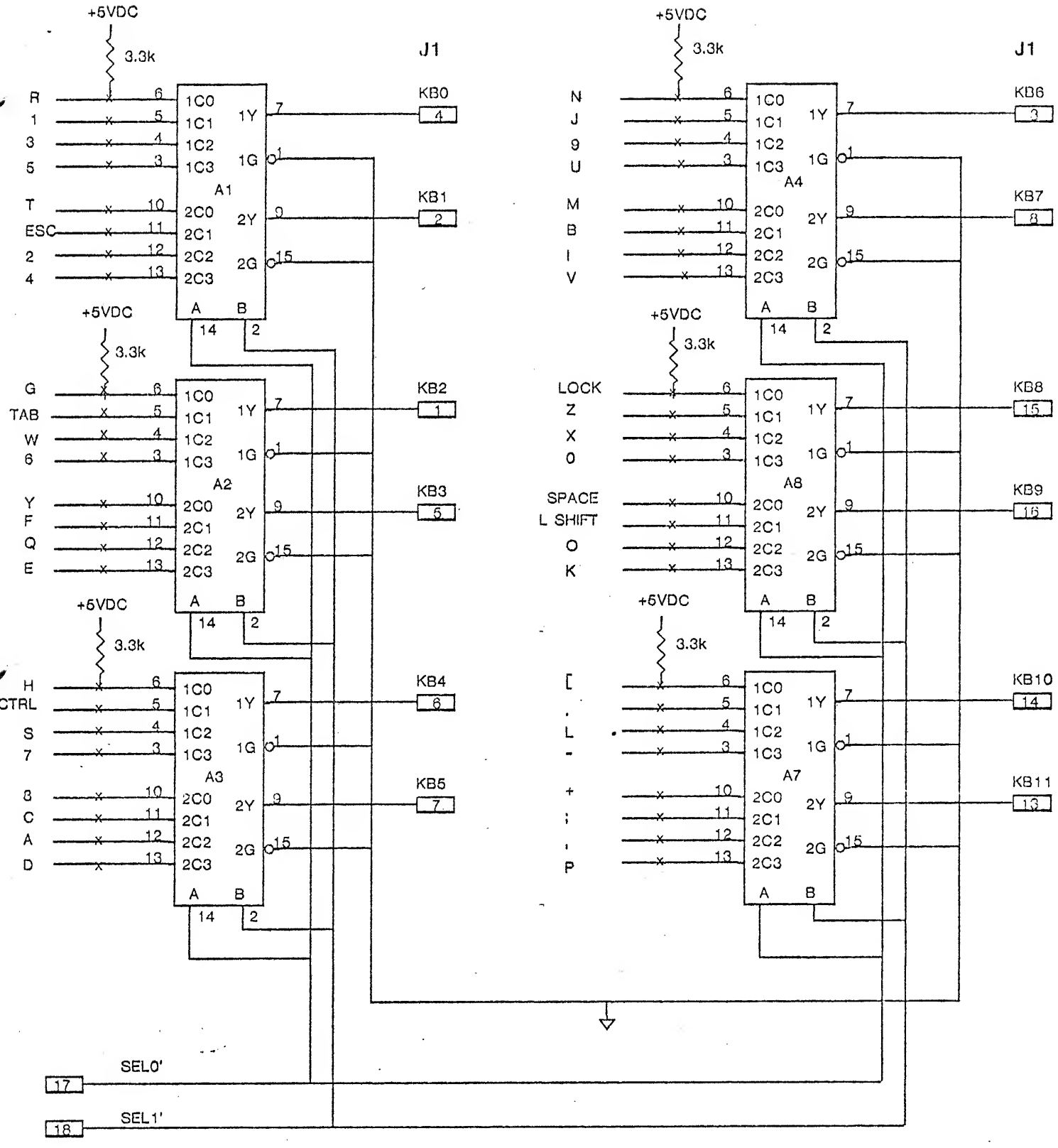
Model No.	Date	Sheet
ALTO II/DO	2/6/78	6 Of 8

Item No.	Drawing Title		Drawing No.	No. Req.	Remarks
1	BOARD PW KEYBOARD		217167	1	
2	SPEC,PROC. KEYBOARD BUTTON		217164-060	1	
3	SWITCH MODULE, MOMENTARY	MICRO-SWITCH	1001SD4B3A	60	S1-17,19-23,35-47,49, 53-63,65,66,68
4	SWITCH MODULE, ALT ACTON	MICRO-SWITCH	1001SD5B3A	1	S51
5	SUPPORT MODULE	MICRO-SWITCH	1001SD6B1D	5	S18,34,48,52,64
6	MICROCIRCUIT SN74153	TI		8	A1-8
7	RESISTOR PACK 8 PIN 3.3K	CTS	750-81-3.3K	6	A9-12,16,20
8	RESISTOR PACK 6 PIN 3.3K	CTS	750-61-3.3K	5	A13,17,18,19,21
9	RESISTOR PACK 8 PIN 1K	CTS	750-81-1.0K	1	A14
10	RESISTOR PACK 6 PIN 1K	CTS	750-61-1.0K	1	A15
11	CAPACITOR CED. .01UF 50V		188483-001	9	C3-11
12	CAPACITOR TANT. 22UF 15V		187720-005	2	C1,2
13	PIN, RETAINER-PLASTIC	MICRO-SWITCH	SD10381	9	
14	PANEL, GRID-KEYBOARD SWITCH		217171	1	
15	SOCKET,MICROCIRCUIT	AUGAT #516-AG11D		2	A7,8



ASSY.PW	ASSY. NO
217166	

XEROX PARC	Project ALTO II/D0	ASSY,PW-KEYBOARD (ALTO II/MICPOSW)	File KEYBRD-D02	Designer ED WAKIDA	Rev B	Date 2/6/78	Page 7



ASSY.PW	ASSY. NO
217166	

XEROX PARC	Project	File	Designer	Rev	Date	Page
	ALTO II/DO	ASSY.PW-KEYBOARD (ALTO II/MICROSW)	KEYBRD-DO1	ED WAKIDA	B	2/6/78	8

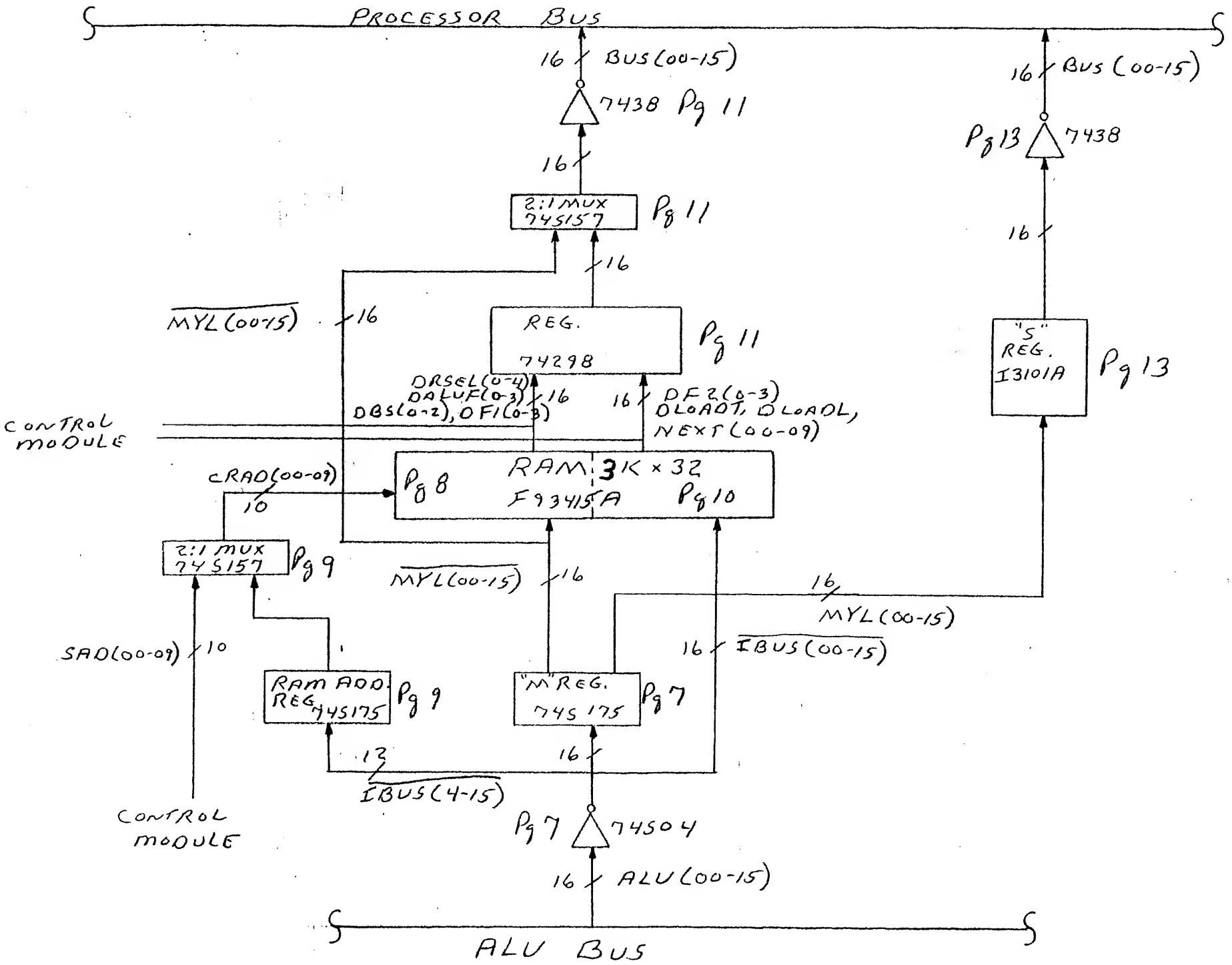
CONTROL RAM

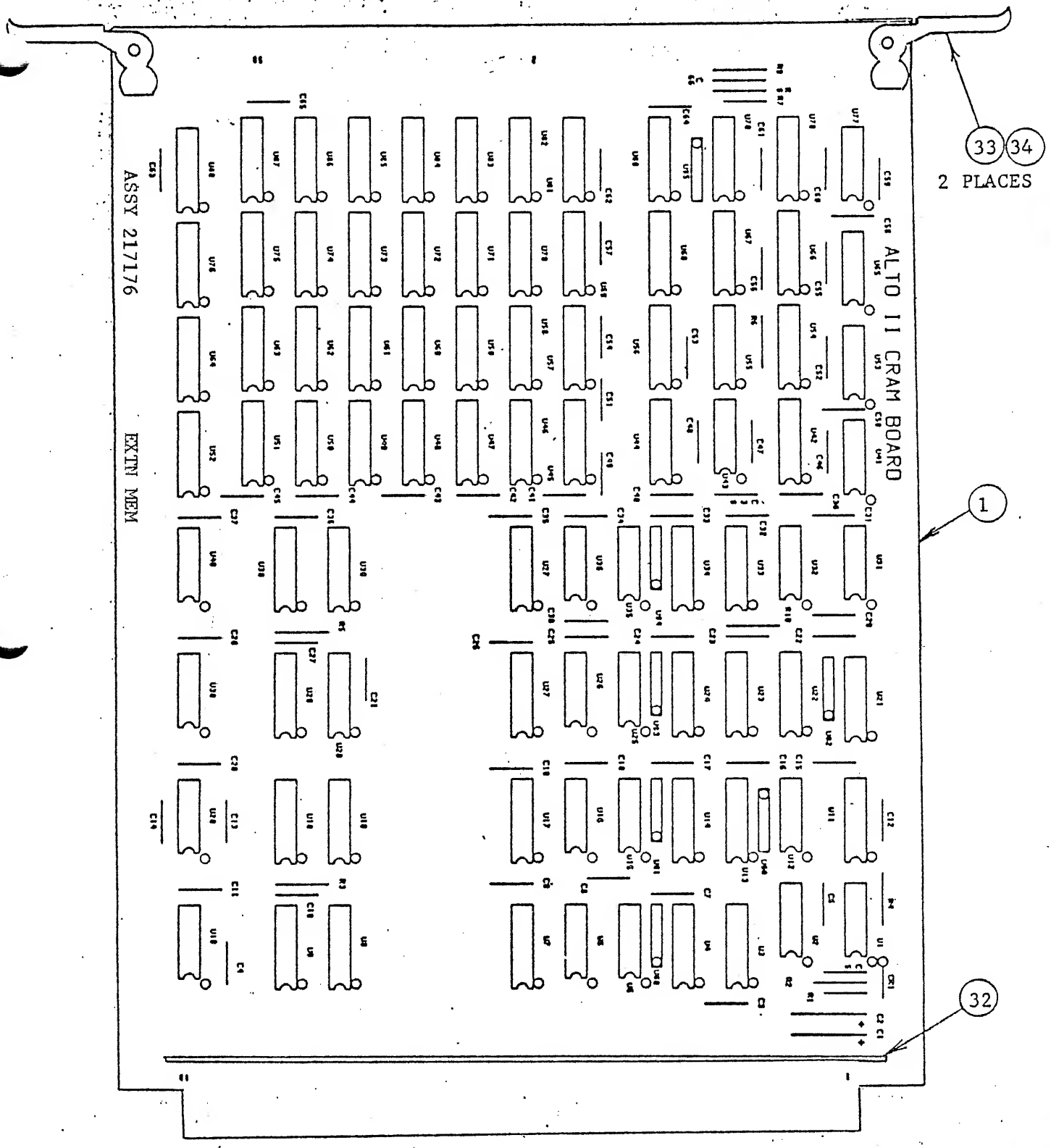
The Control Ram is a standard logic card containing a fast (90 nsec.) 1024-word by 32-bit read/write microinstruction memory, an even faster (40 nsec.) 32-word by 16-bit read/write memory (S registers), and logic to interface those memories to the Alto's microinstruction bus, processor bus, and ALU output. Unlike other microinstruction memories in the Alto, the larger memory of the Control Ram can hold microinstructions and/or data.

RAM-RELATED TASKS

The Control Ram performs data manipulation (as distinct from microcode fetching) functions in reponse to the microinstruction. Not all tasks are likely to be interested in these functions. Moreover, not all tasks will have the appropriate values for the microinstruction uncommitted. A Ram-related task is defined as one during whose execution the Control Ram card will respond to microinstructions. The standard Alto is wired so that the CPU emulator task is the only Ram-related task.

CRAM AND EXTENDED MEMORY CRAM MODULE
CRAM & CRAM (XM)





Title
ALTO II
ASSEMBLY, PW-
CRAM
(EXTN MEM)

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217176 D

Sheet 3 Of

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Material List

ML	Drawing No.	Rev.
	217176	D

Drawing Title: ALTO II
ASSEMBLY, PRINTED WIRING-
CRAM
(EXTN MEM)

Rev. D | Drawing No. 217176- | ML

Model No. ALTO II XM | Date 3/10/78 | Sheet 4 Of

Item No.	Drawing Title	Drawing No.	No. Req.	Remarks
1	BOARD, P.W,	217135	1	
2	PROCEDURE, TEST	216366	REF	
3	SPEC, ASSEMBLY	216207	REF	
4				
5	MICROCIRCUIT, SN 74H00 T.I.		2	U2, 53
6	SN 74H04		2	U1, 65
7	SN 74S04		4	U10, 20, 30, 40
8	SN 74H10		2	U12, 41
9	SN 74H21		1	U32
10	SN 74H30		2	U31, 43
11	SN 7438		8	U5, 6, 15, 16, 25, 26,
				35, 36
12	SN 74T53		1	U54
13	SN 74S157		7	U7, 17, 27, 37, 56, 68, 80
14	SN 74166		2	U66, 78
15	SN 74S174		2	U22, 44
16	SN 74S175		9	U9, 11, 19, 29, 39, 42, 55,
				67, 79
17	SN 74298 T.I.		4	U8, 18, 28, 38
18	SN 74S03		1	U77
19	I 3101A INTEL		8	U3, 4, 13, 14, 23, 24, 33, 34
20				
21	I 3601-1 INTEL		1	U21
22	MICROCIRCUIT, F93415A FAIRCHILD (3)		32	U45-52, 57-64, 69-76,
				81-88
23	SOCKET, 14 PIN DIP, AUGAT#514-AG 11D		22	
24	SOCKET, 16 PIN DIP, AUGAT#516-AG11D		66	
25				
26	DIODE, IN4148		1	CR1
27				
28				
29				
30				

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Material List

ML	Drawing No.	Rev.
	217176	D

Rev. D

Drawing Title
ALTO II
ASSEMBLY, PRINTED WIRING-
CRAM
(EXTN MEM)

Drawing No. 217176

ML

Model No.	Date	Sheet
ALTO II XM	3/10/78	5 Of

Item No.	Drawing Title	Drawing No.	No. Req.	Remarks
31	CAPACITOR, 22μF ±20%, 15V	187720-005	2	C1, C2
32	CAPACITOR, .05μF	188483-002	62	C3, C4, C6 THRU 65
33	~~CAPACITOR, .022μF~~		~~1~~	~~C66~~
34	CAPACITOR, 180PF		1	C5
35				
36	~~RESISTOR, FILM, 200 Ω, ±5%, 1/4W~~	~~116447-201~~	~~1~~	~~R7~~
37	RESISTOR, FILM, 1K Ω, ±5%, 1/4W	116447-102	6	R3 thru 6, 8, 9
38	RESISTOR, FILM, 2.7K, ±5%, 1/4W	116447-272	1	R1
30	RESISTOR, NETWORK, 330 Ω, CTS 750-61-R330		7	U89 THRU U95
31	RESISTOR, FILM, 330 Ω, ±5%, 1/4W	116447-331	1	R10
32	STIFFENER	216242	1	
33	EXTRACTOR	216250	2	
34	RIVET	156111-005	2	

Title
ALTO II
ASSEMBLY, P.W.-
CRAM
(EXTN MEM)

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217176

D

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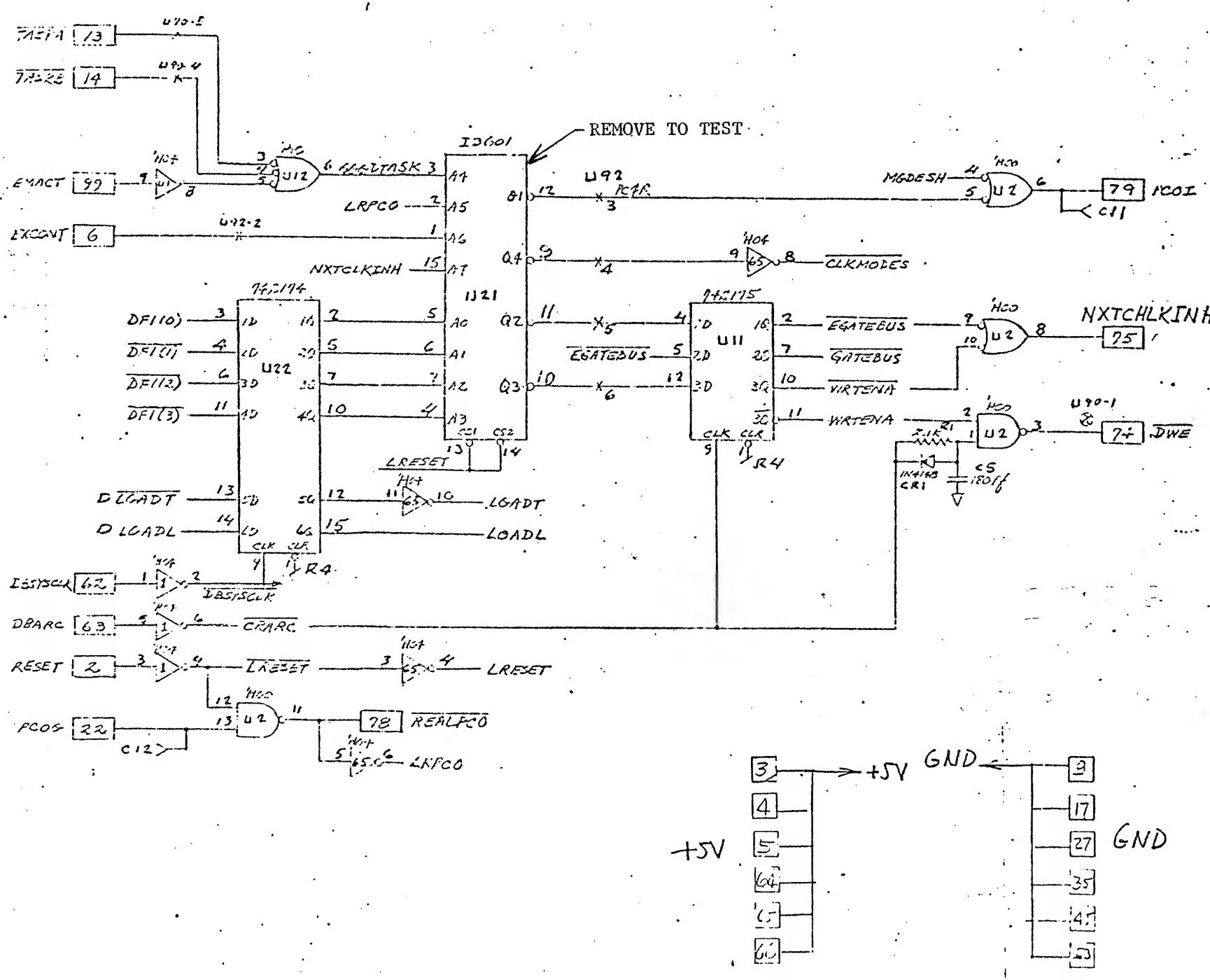

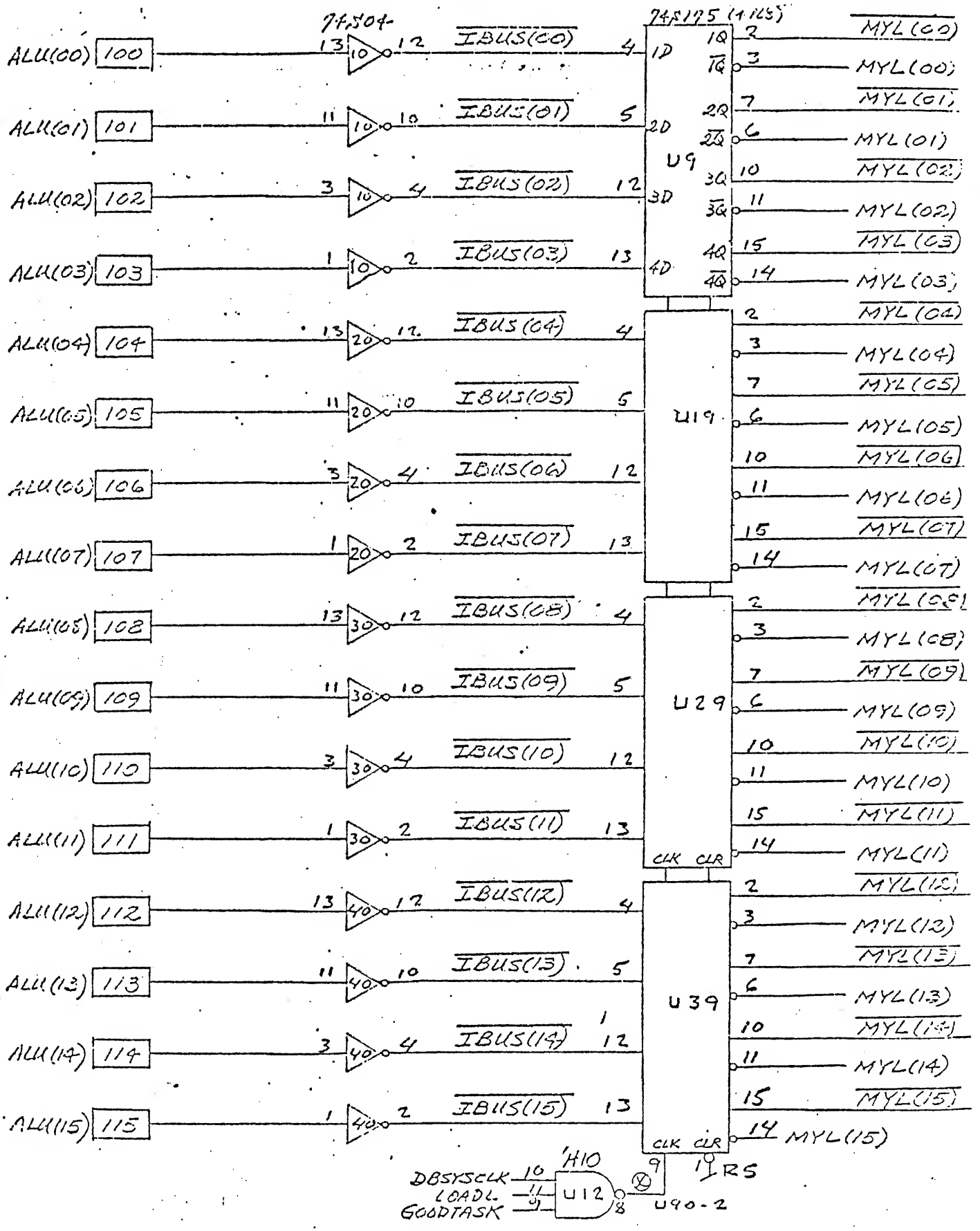

Title
ALTO II
ASSEMBLY, P.W.-
CRAM
(EXTN MEM)

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XEROX

217176 D

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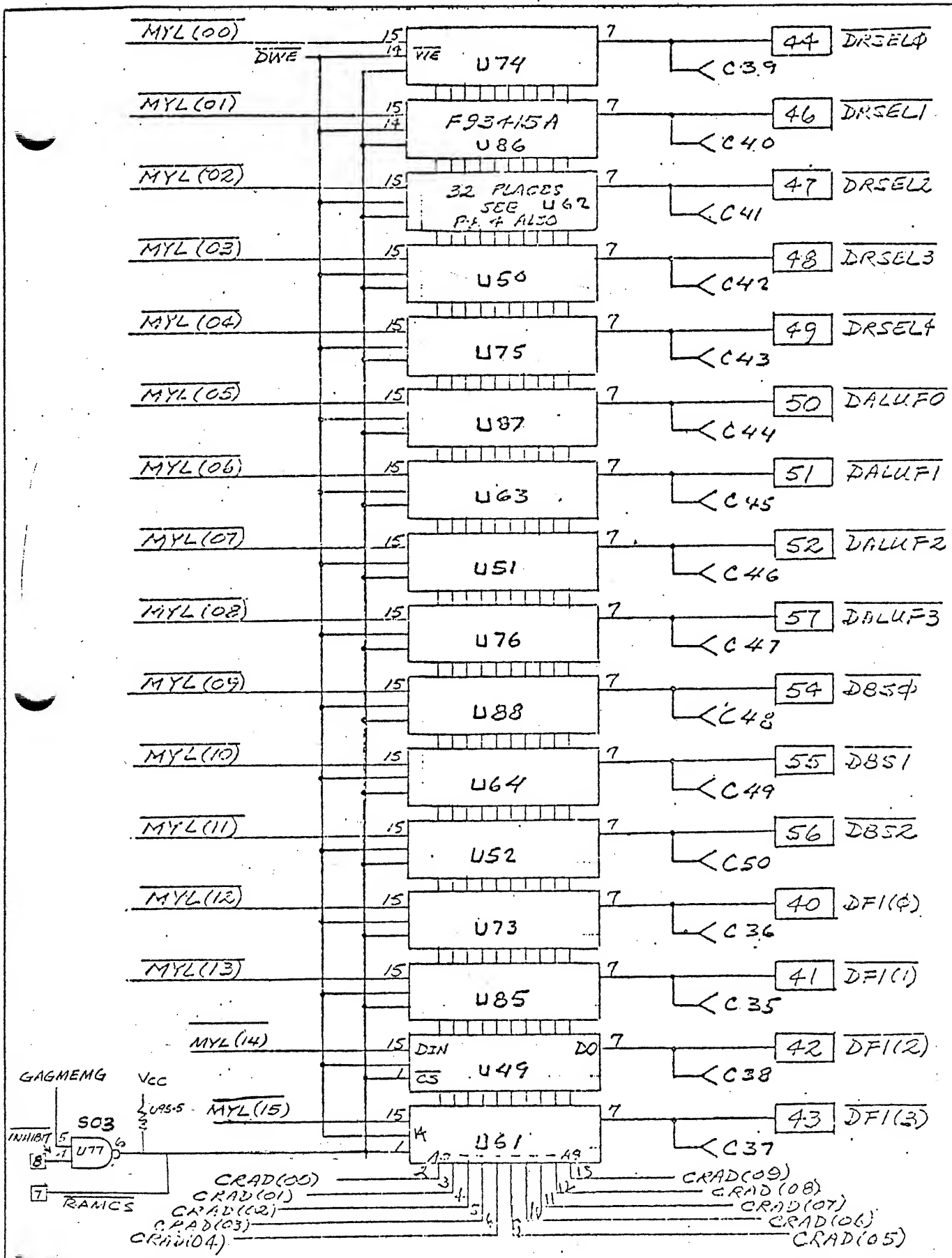


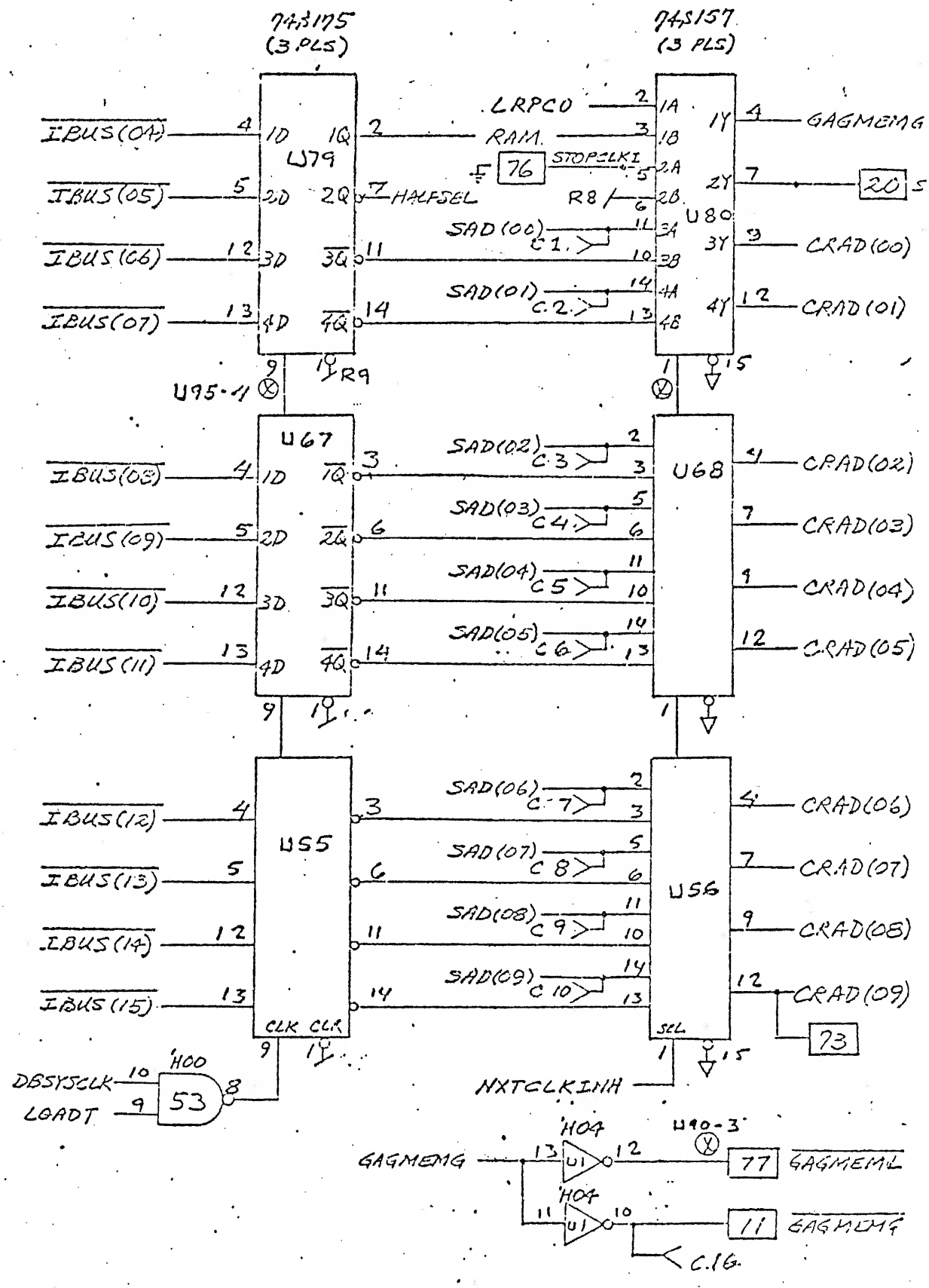
Title
ALTO II
ASSEMBLY, P.W.-
CRAM
(EXTN MEM)

Xerox Corporation
El Segundo, California

XEROX

217176 D

Sheet 8 Of



Title

ALTO II

ASSEMBLY, P.W.-

CRAM (EXTN MEM)

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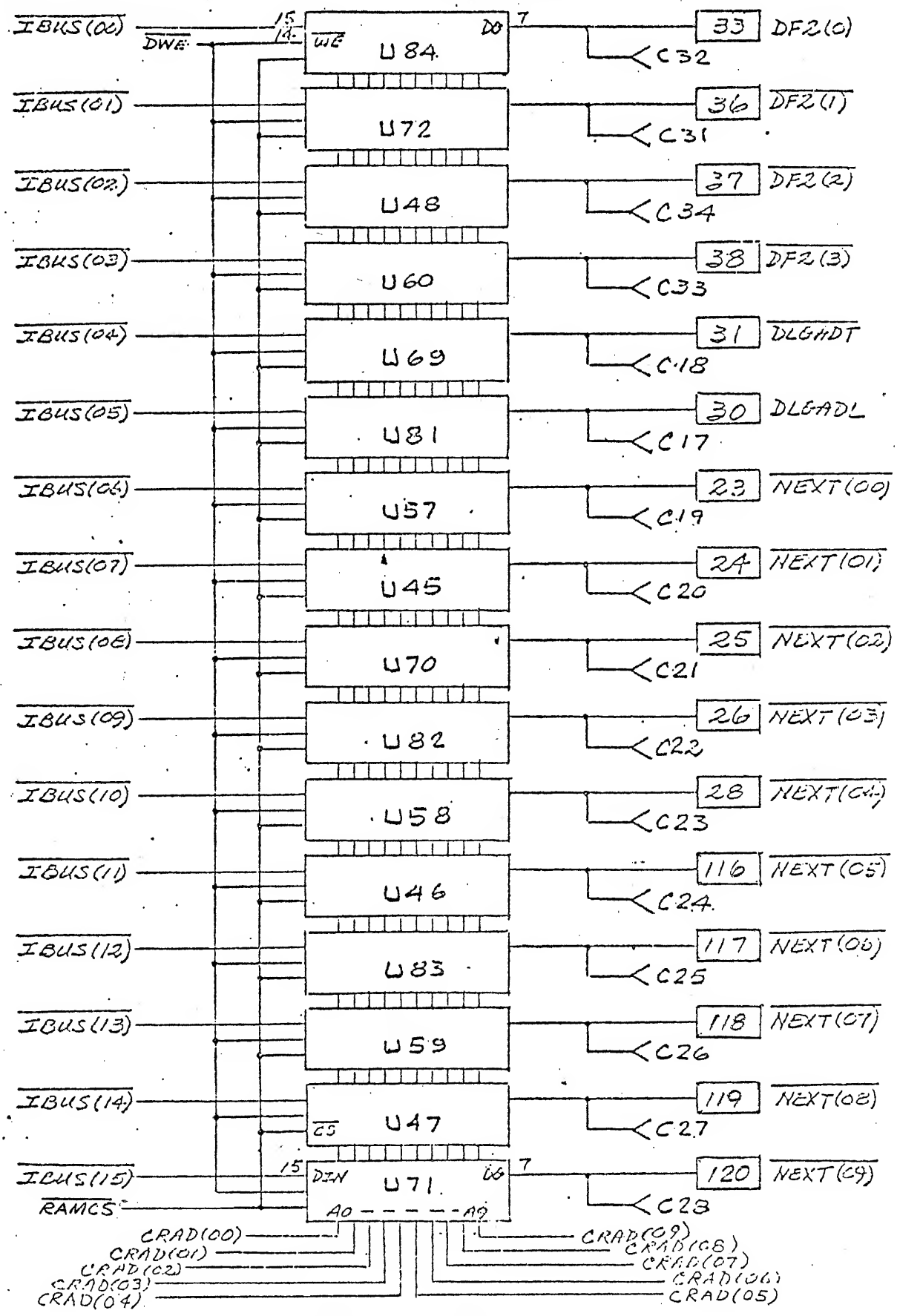
217176 D

Sheet 9 Of



Title

ALTO II

ASSEMBLY, P.W.-

CRAM (EXTN MEM)

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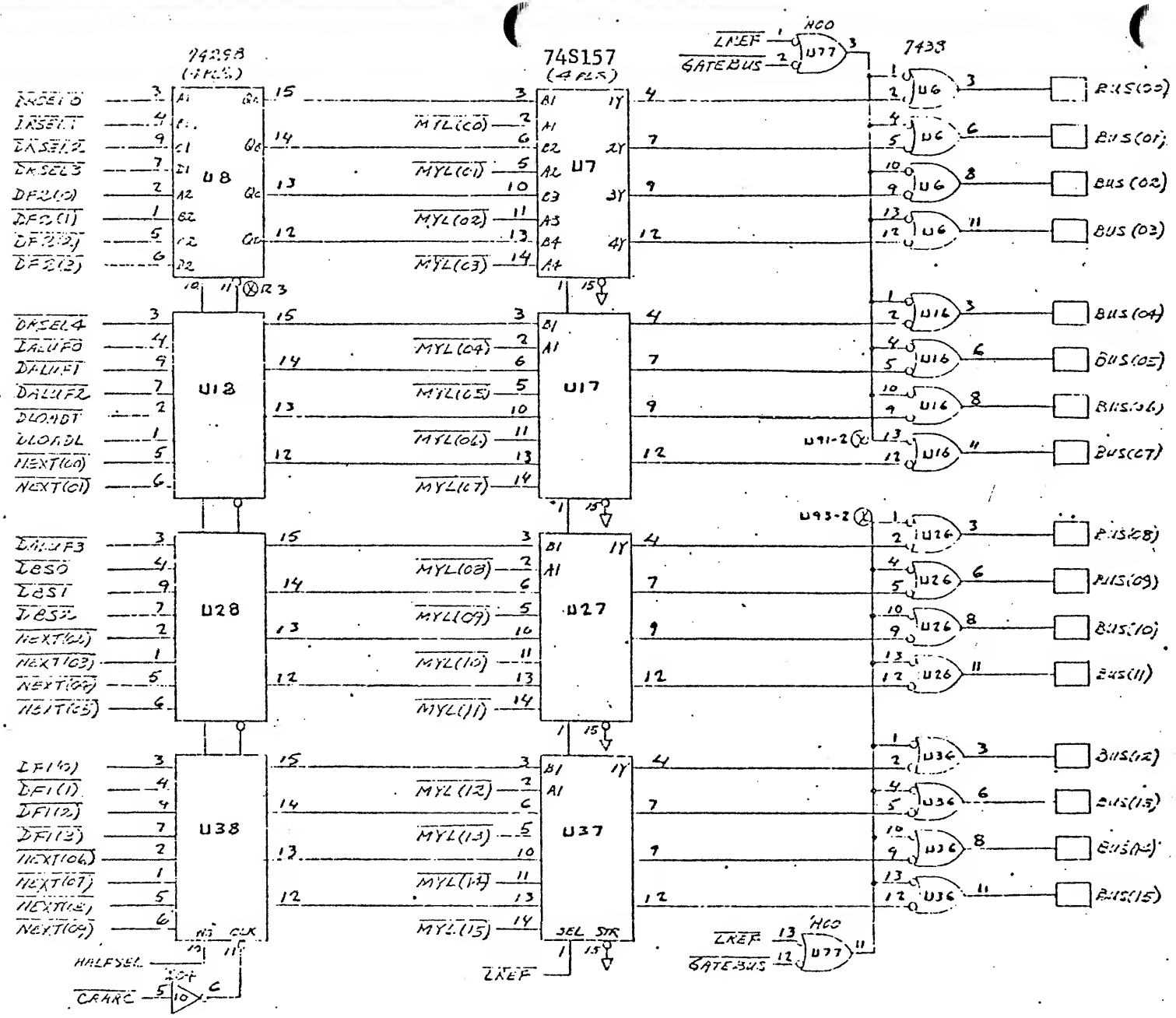
217176-[illegible]

D

Sheet 10 of



Title

ALTO II

ASSEMBLY, P.W.-

CRAM (EXTN MEM)

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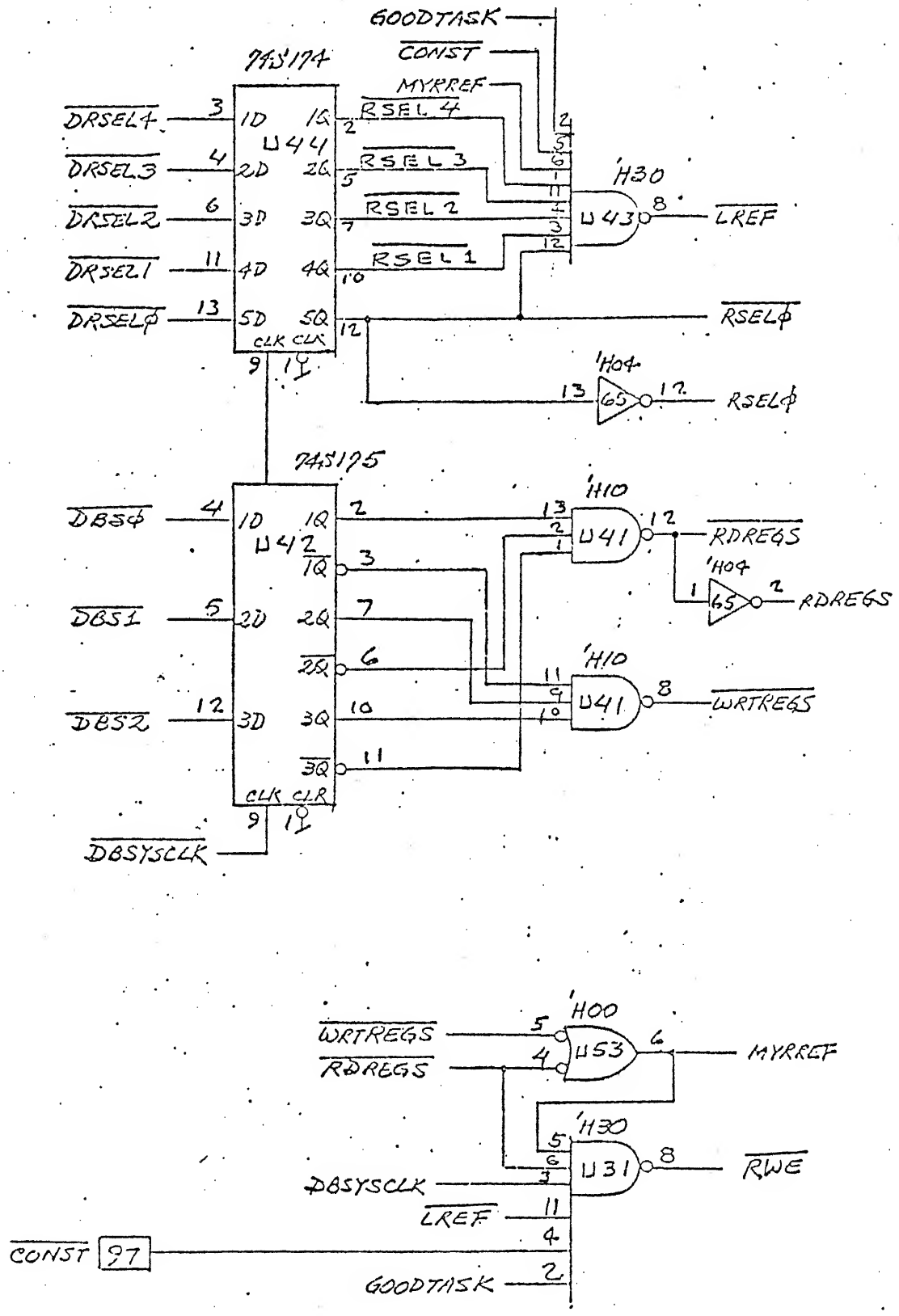
D

Sheet 11 of



Title
ALTO II
ASSEMBLY, P.W.-
CRAM (EXTN MEM)

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El Segundo, California

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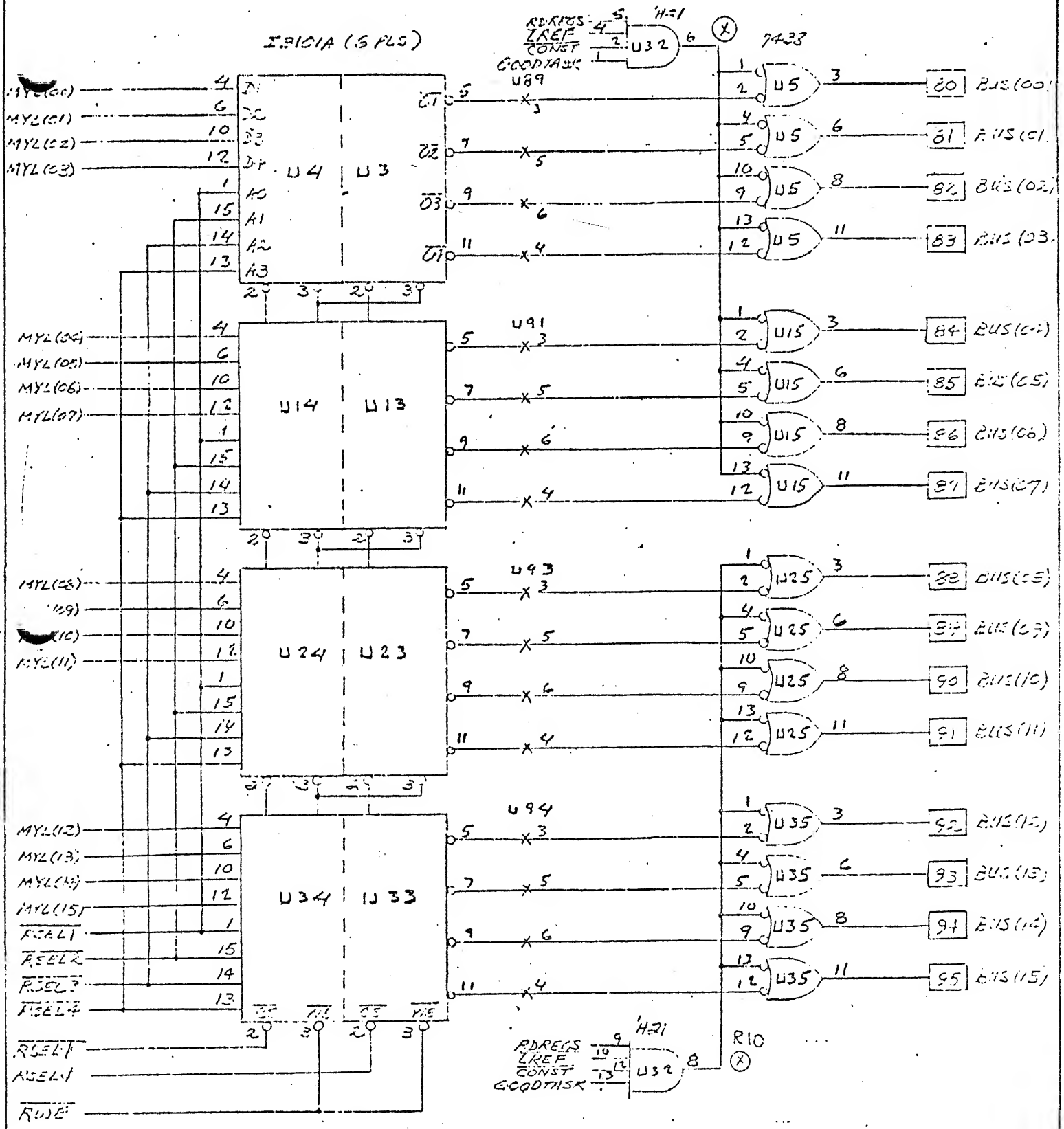
217176 D

Sheet 12 Of



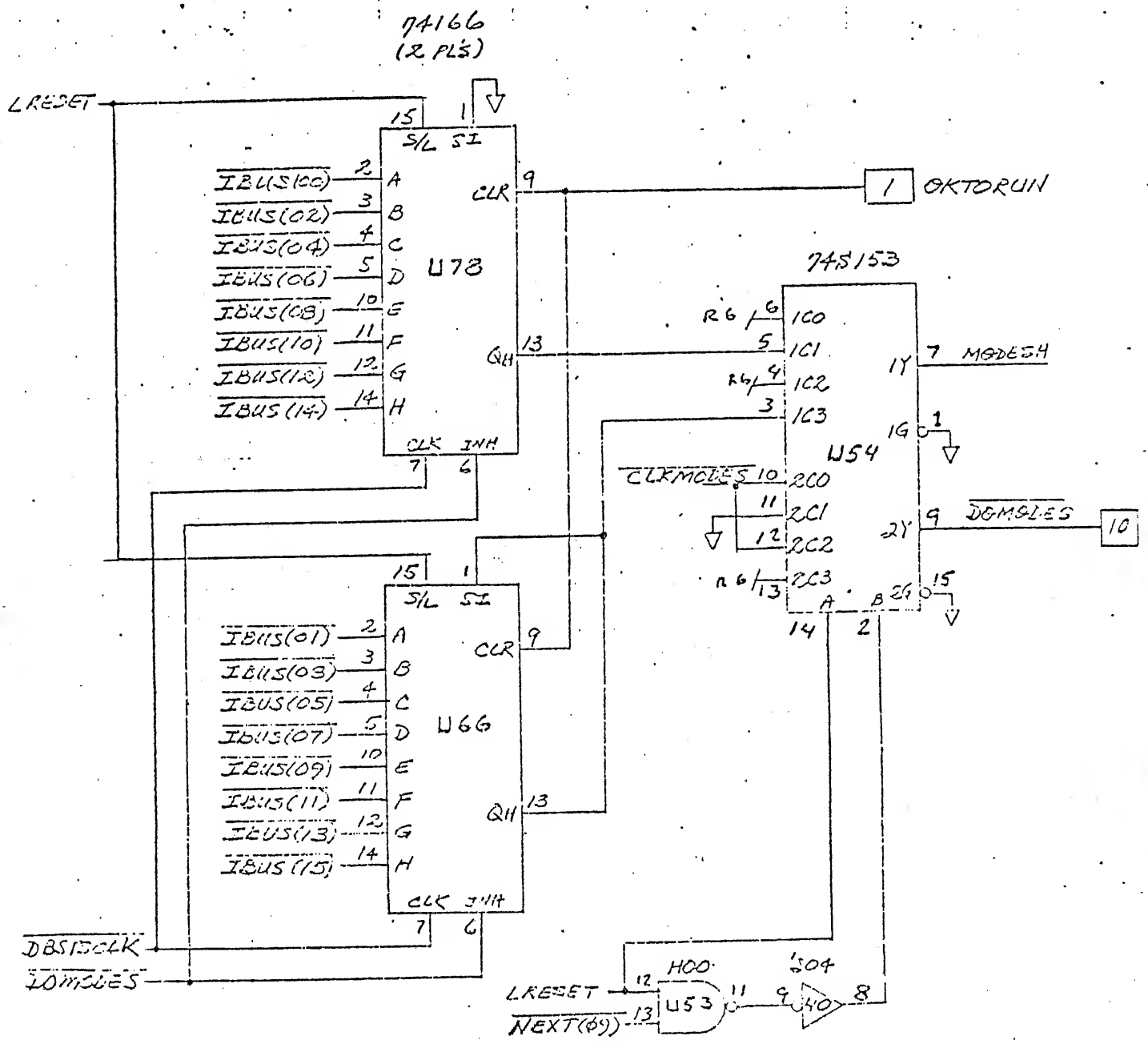
Title
ALTO II
ASSEMBLY, P.W.-
CRAM
(EXTN MEM)

Xerox Corporation
El Segundo, California

XEROX

217176 D

Sheet 13 Of



Title

ALTO II

ASSEMBLY, P.W.-

CRAM

(EXTN MEM)

Xerox Corporation
El Segundo, California

XEROX

217176 D

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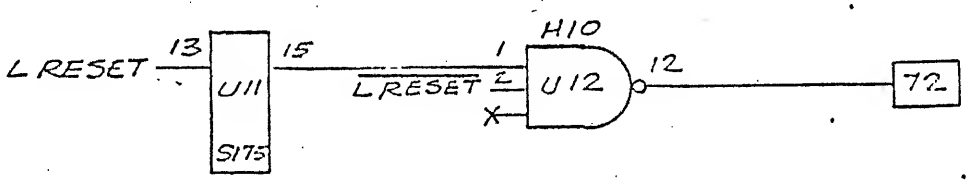

Title
ALTO II
ASSEMBLY, P.W. -
CRAM
(EXTN MEM)

Xerox Corporation
El Segundo, California

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217176 D

Sheet 15 Of

MICROPROCESSOR CONTROL

Control of the Alto microprocessor is shared among 16 "tasks" arranged in a priority order. The tasks are numbered 0 to 15: 0 is the lowest priority and 15 is the highest. The lowest priority task is the emulator task which fetches instructions and executes them.

BRANCHING

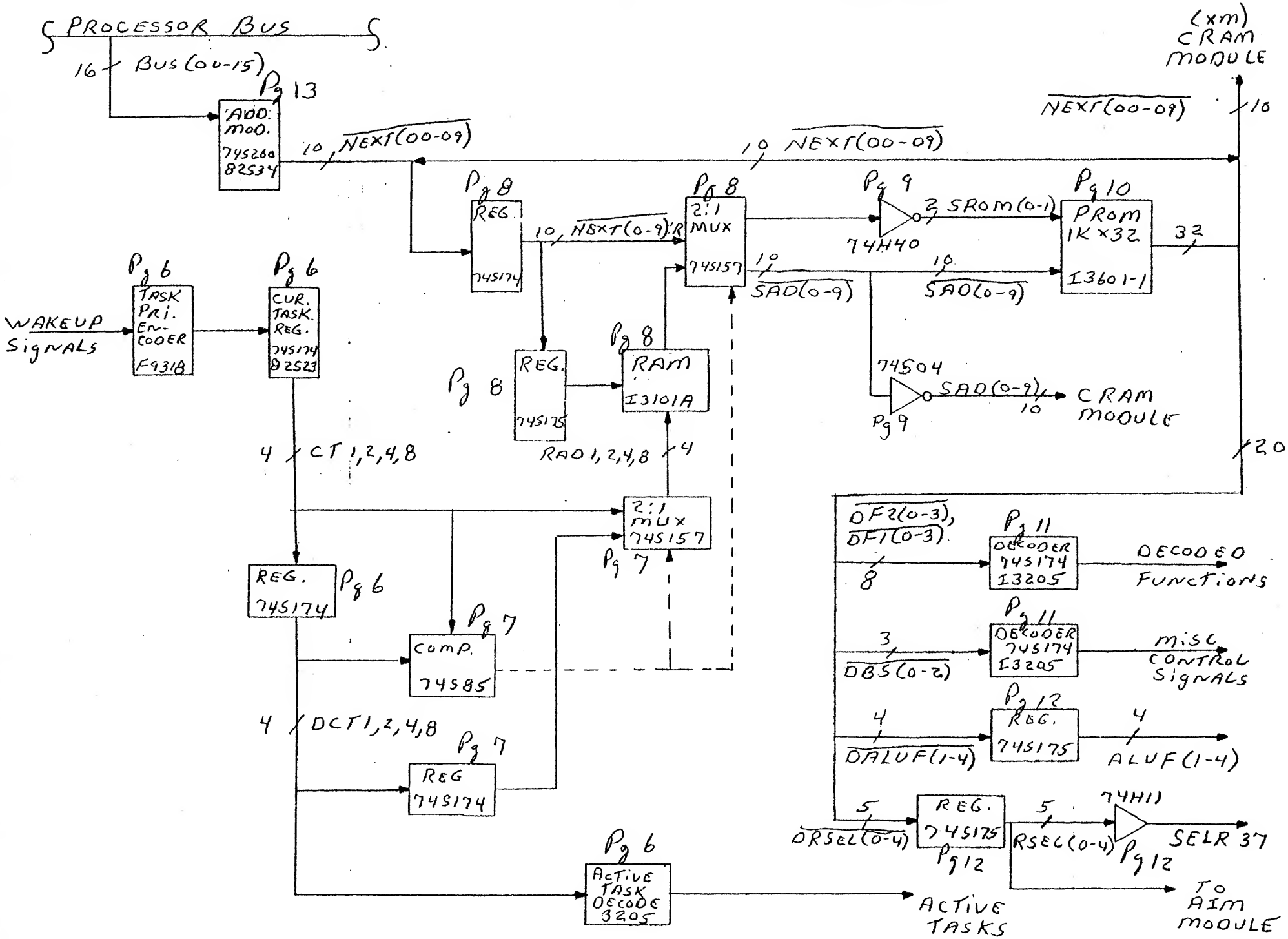
The microprocessor offers a limited branching capability which, although somewhat cumbersome, has proven adeqeuate for chores undertaken by Alto microcode. The basic idea is that special microprocessor functions may modify the NEXT field, and consequently, alter the flow of control. Modification is accomplished by ORing various bits into the NEXT field.

TASK SWITCHING

Only one of the 16 tasks is executing microinstructions at any one time. Once a task begins execution, it continues to execute until it invokes a task switch function that enables switching to another task.

A task is considered eligible for execution if its hardware-generated "wakeup signal" is asserted (these signals are not accesible to the microprogram). The wakeup signals enter a priority encoder that calculated the number of the highest-priority eligible task. When a running task invokes a task switch, control will switch to another task only if a higher priority task has a wakeup signal held true, or if the current task no longer has a wakeup signal true. In the latter case, control goes to a lower priority task. The lowest priority task is the CPU emulator, which is always requesting wakeup.

CONTROL, EXTENDED MEMORY CONTROL, 2K CONTROL AND EXTENDED MEMORY 2K CONTROL MODULES



NOTES: UNLESS OTHERWISE SPECIFIED

1. ASSEMBLE PER ALTO II MODULE ASSY SPEC, DWG NO. 216207.

2. THIS ASSEMBLY REPLACES ASSY NO. 216642 WHICH IS OBSOLETE.

3. SPECIAL INSTRUCTIONS TO INSTALL 2ND K OF PROMS

   A. THE ALTO II CONTROL MODULE (2K) IS SHIPPED WITH THE 1ST K OF PROM INSTALLED ONLY AND THE MODULE IS OPERATED WITH THE REST OF THE ALTO II SYSTEM EXACTLY THE SAME WAY AS THE OLD CONTROL MODULE.

   B. A SET OF VIRGIN PROMS FOR THE 2ND K ADDRESS LOCATIONS ARE PROVIDED WITH THE MODULE AND PLACED IN THE IC LOCATION WHERE THE 2ND K PROM IS NORMALLY INSTALLED.

   C. WHEN THE 2ND K OF PROM IS INSTALLED, THE "SW MODE. 1K" SWITCH MODE CONTROL PROM (U50) MUST BE REPLACED WITH THE CONTROL PROM "SW MODE. 2K" WHICH IS ALSO PROVIDED AND PLACED IN THE SPARE LOCATION U76.

   D. THE PLACEMENT OF THE 2ND K PROM IS AS FOLLOWS:

BITS	LOCATION
0 - 3	U54
4 - 7	U74
8 - 11	U75
12 - 15	U73
16 - 19	U52
20 - 23	U70
24 - 27	U71
28 - 31	U72

(4) RUBBER STAMP "ASSY 21715A" .12 HIGH, WHITE CHARACTERS.

(5) RUBBER STAMP "EXTN MEM".12 HIGH, WHITE CHARACTERS.

6. THE FOLLOWING MODIFICATIONS ARE REQUIRED USING REV "B" PW BOARD TO ALLOW FOR TESTING ON TERADYNE PWBA TESTER:

   A. CUT ETCH FROM U35-2 TO U35-4 (ETCH SIDE).

   B. ADD JUMPER FROM U35-4 TO U81-6 (ETCH SIDE).

   C. ADD JUMPER FROM U81-6 TO P3(T)-10.

Title: ASSY, PRINTED WIRING-CONTROL BOARD (2K) (EXTN MEM)

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El Segundo, California

XEROX

217175 B

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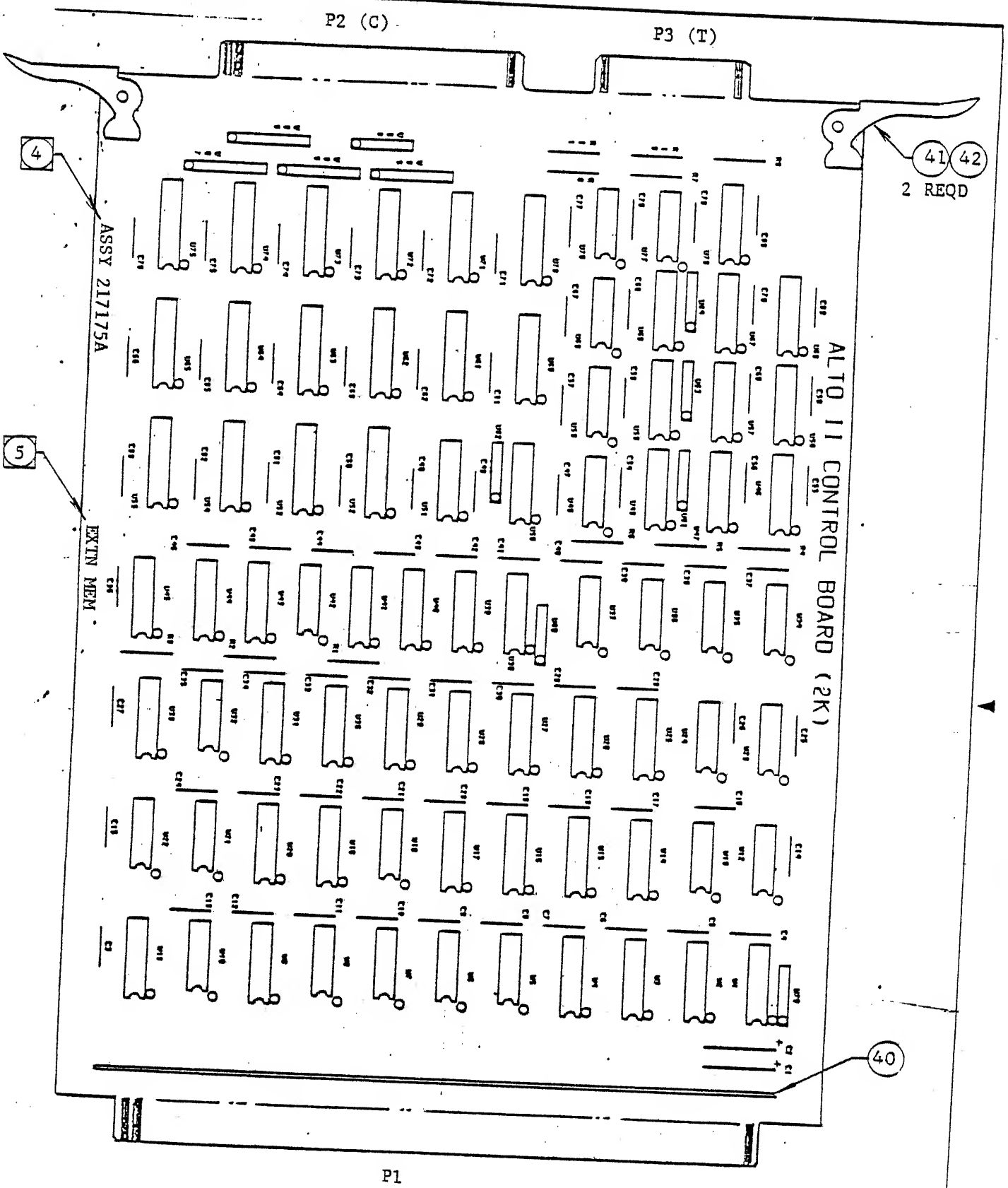

Title

ASSEMBLY, P. W. -
CONTROL BOARD (2K)
(EXTN MEM)

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217175 B

Sheet 3 Of

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aterial List

ML | Drawing No. 217175 | Rev. B

ing Title

ASSEMBLY, PRINTED WIRING-

CONTROL BOARD (2K)
(EXTN MEM)

Model No. ALTO II XM | Date 3/10/78 | Sheet 4 Of

Item No.	Drawing Title	Drawing No.	No. Req.	Remarks
1	Board, Printed Wiring- Control Board (2K)	217129	1	
2	Spec, Module Assembly	216207	REF	
3				
4				
5	Microcircuit, 74H00		3	U22, 24, 34
6	74H01		1	U37
7	74S02		3	U18, 21, 78
8	74H04		3	U7, 8, 23
9	74S08		1	U32
10	74H10		1	U13
11	74H11		1	U10
12	74H21		1	U12
13	74H40		2	U35, 77
14	74S85		1	U26
15	74S157		4	U14, 48, 58, 68
16	74S153		1	U50
17	74S174		7	U15, 25, 27, 39, 40, 41, 43
18	74S175		5	U44, 45, 46, 56, 66
19	74S260		3	U5, 6, 36
20	I3101A (Intel)		3	U47, 57, 67
21	I3205 (Intel)		6	U16, 17, 19, 20, 30, 31
22	I3601-1 (Intel)		2	U3, 51
23	74S00		1	U11
24	7425		1	U42
25	82S23 (Signetic)		1	U38
26	82S31 (Signetic)		1	U9
27	82S34 (Signetic)		3	U4, 28, 29
28	F9318 (Fairchild)		2	U1, 2
29	74S04		3	U49, 59, 69
30	Microcircuit, 82S136 (Signetic)		16	U52 thru 55, 60 - 65, 70 - 75
31	Capacitor, .05μF, 50 V	188483-002	78	C3 thru 80
32	Capacitor, 22μF, 15 V, Tant.	187720-005	2	C1, 2
33				

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Material List

Drawing Title

ASSEMBLY, PRINTED WIRING-

CONTROL BOARD (2K)

(EXTN MEM)

ML	Drawing No. 217175	Rev. B

Rev.

Drawing No. 217175

ML

Model No. ALTO II XM | Date 3/10/78 | Sheet 5 Of

Item No.	Drawing Title	Drawing No.	No. Req.	Remarks
34	Resistor, 1K, ±5%, 1/4W	116447-102	11	R1, thru 11
35	Resistor Network, (SIP) CTS-750-81-R330		3	U86, 87, 89
36	Resistor Network, (SIP) CTS-750-61-R330		5	U79, thru 84
37	Socket Augat #514-AG11D		24	
38	Socket Augat #516-AG11D		38	
39	Socket Augat #518-AG11D		16	
40	Stiffener	216242	1	
41	Extractor	216250	2	
42	Rivet	156111-005	2	
43	Resistor Network, (SIP) CTS-750-61-R220		1	U88
44	Resistor Network, (SIP) CTS-750-81-R220		1	U85

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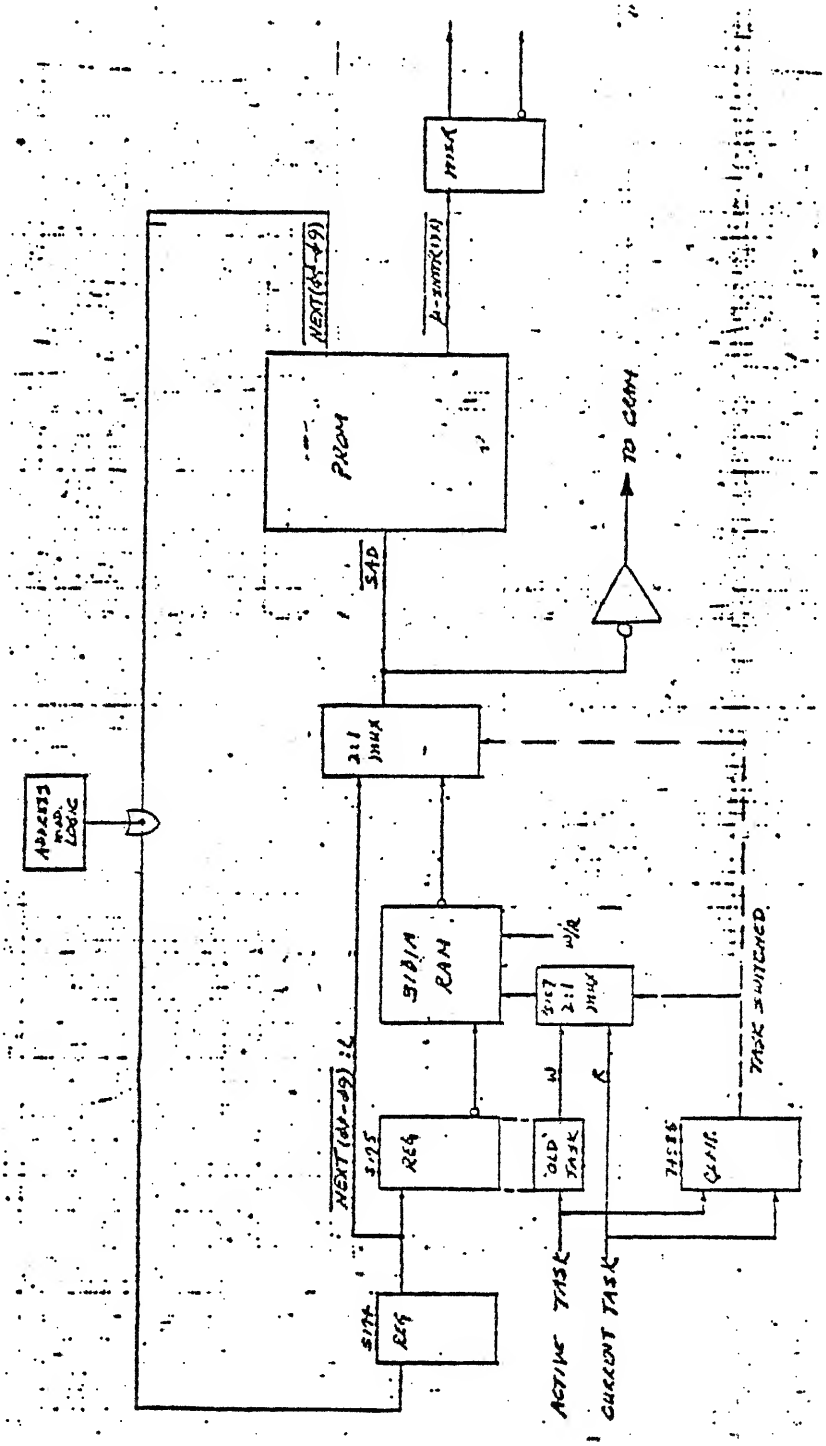

Title

ASSY, P. W. -

CONTROL BOARD (2K)

(EXTENDED MEMORY)

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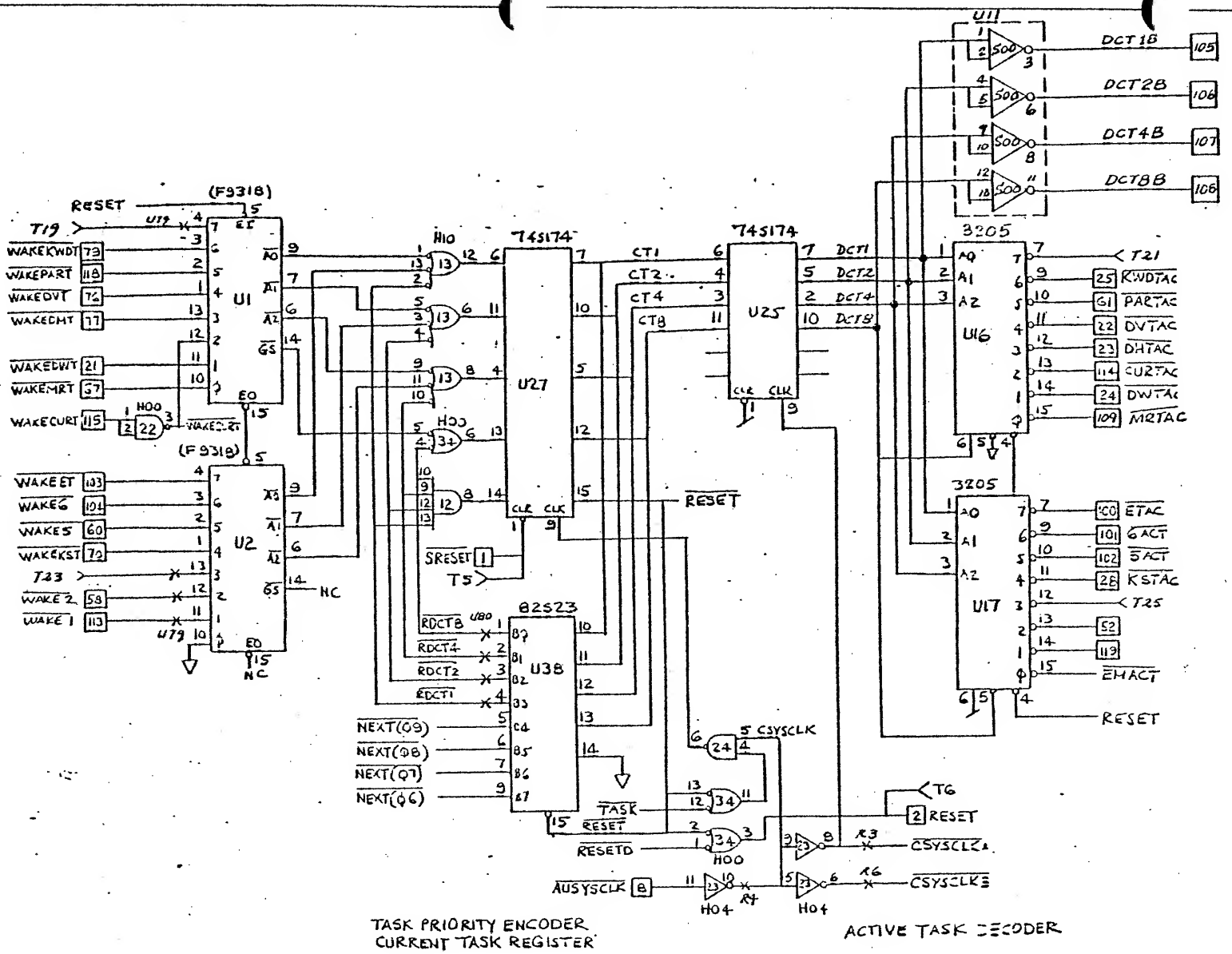

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ASSEMBLY, P. W. -
CONTROL BOARD (2K)
(EXTENDED MEMORY)

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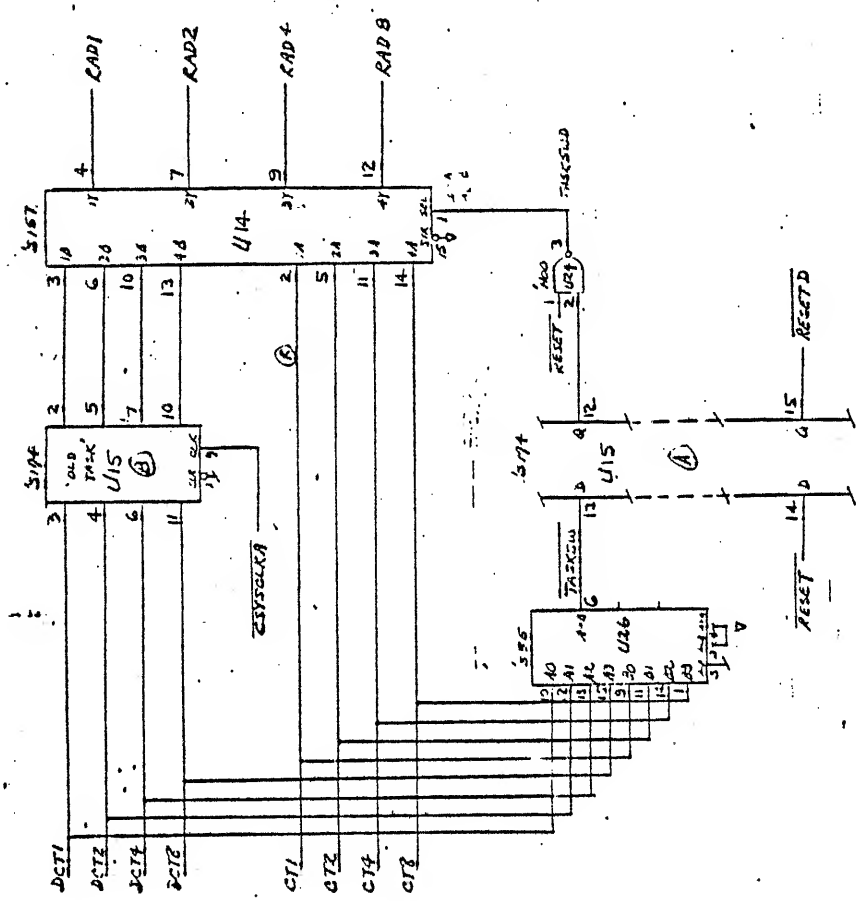

Title

ASSEMBLY, P. W. -
CONTROL BOARD (2K)
(EXTENDED MEMORY)

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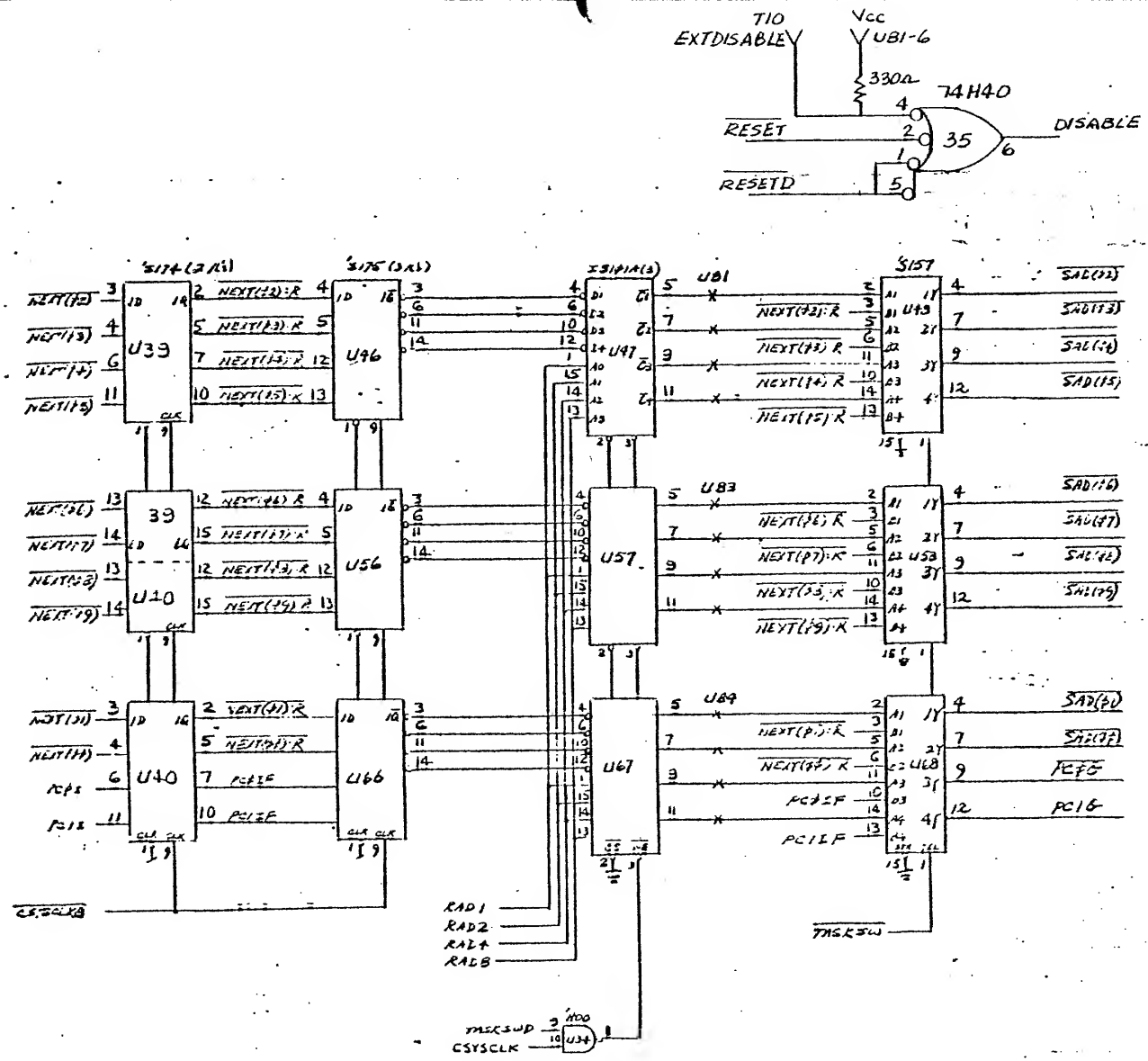

Title

ASSEMBLY, P. W. -
CONTROL BOARD (2K)
(EXTENDED MEMORY)

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Title

ASSEMBLY, P. W. -

CONTROL BOARD (2K)

(EXTENDED MEMORY)

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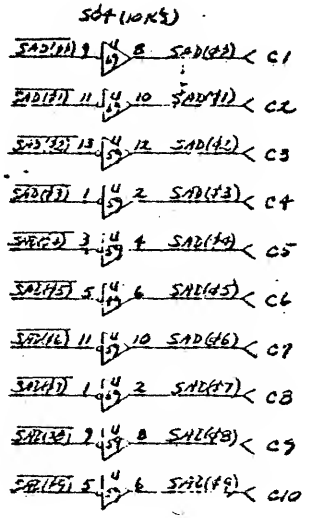
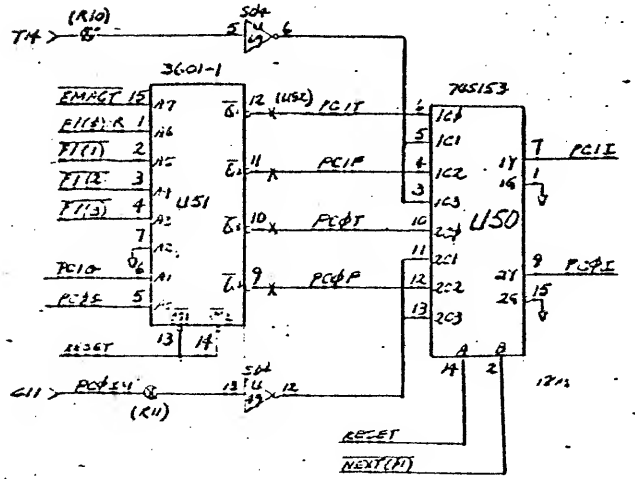
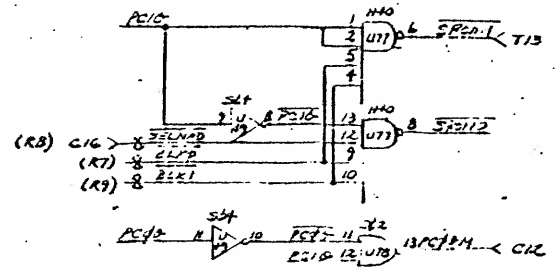
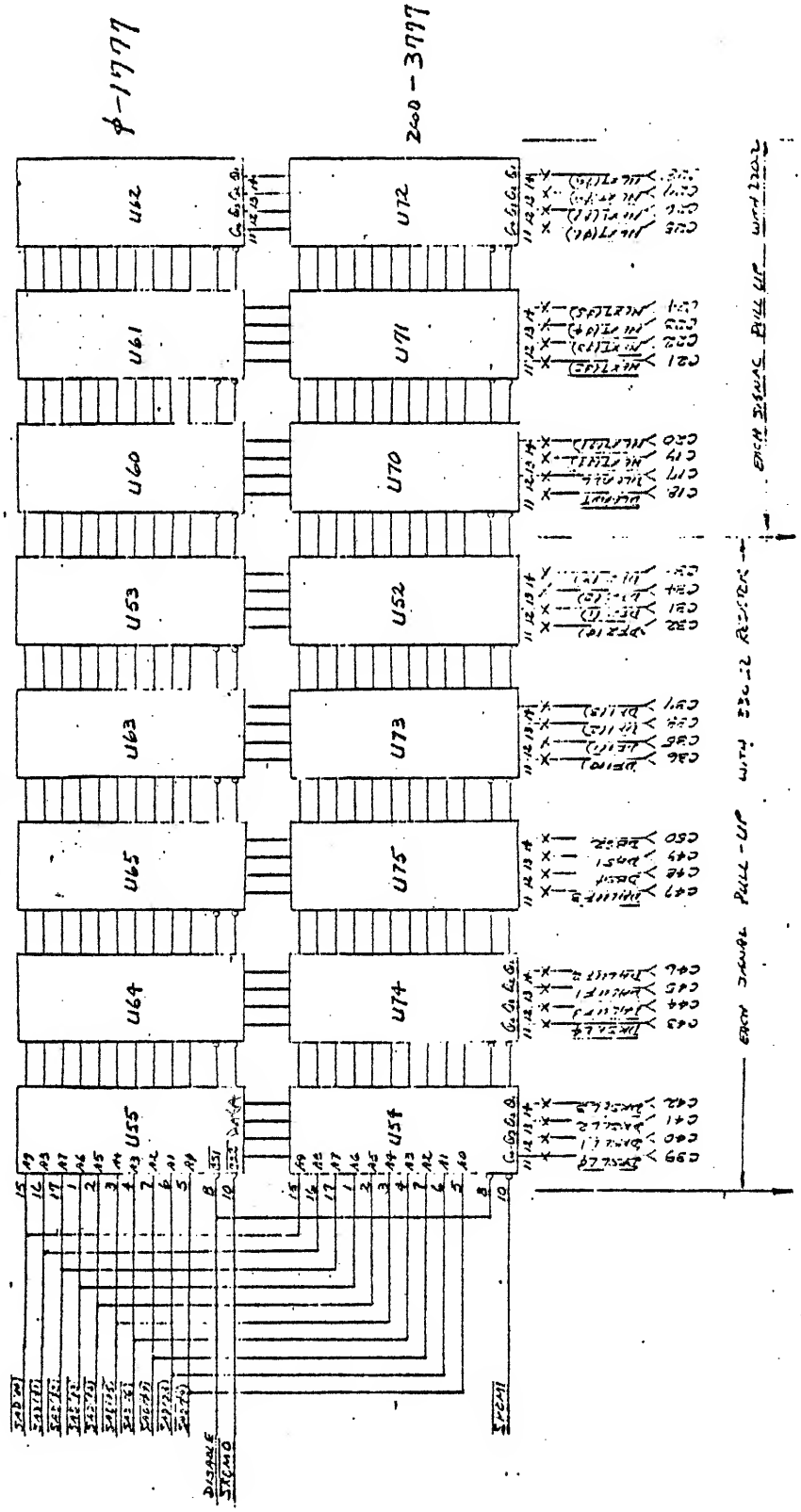






X EACH SIGNAL PULL-UP WITH 330 Ω RESISTOR

● EACH SIGNAL PULL-UP WITH 1KΩ RESISTOR



Title

ASSEMBLY, P. W. -
CONTROL BOARD (2K)
(EXTENDED MEMORY)

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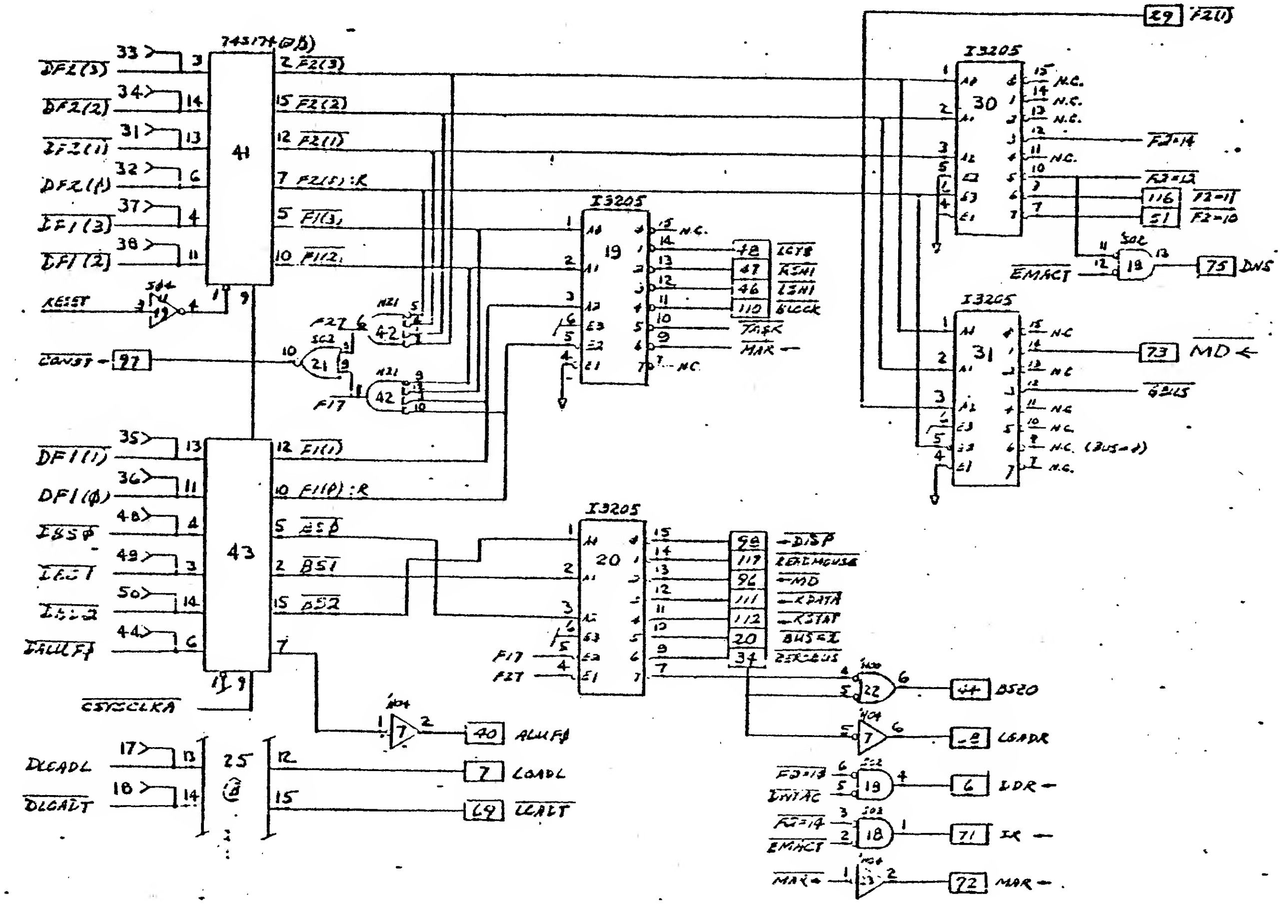

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ASSEMBLY, P. W. - CONTROL BOARD (2K) (EXTENDED MEMORY)

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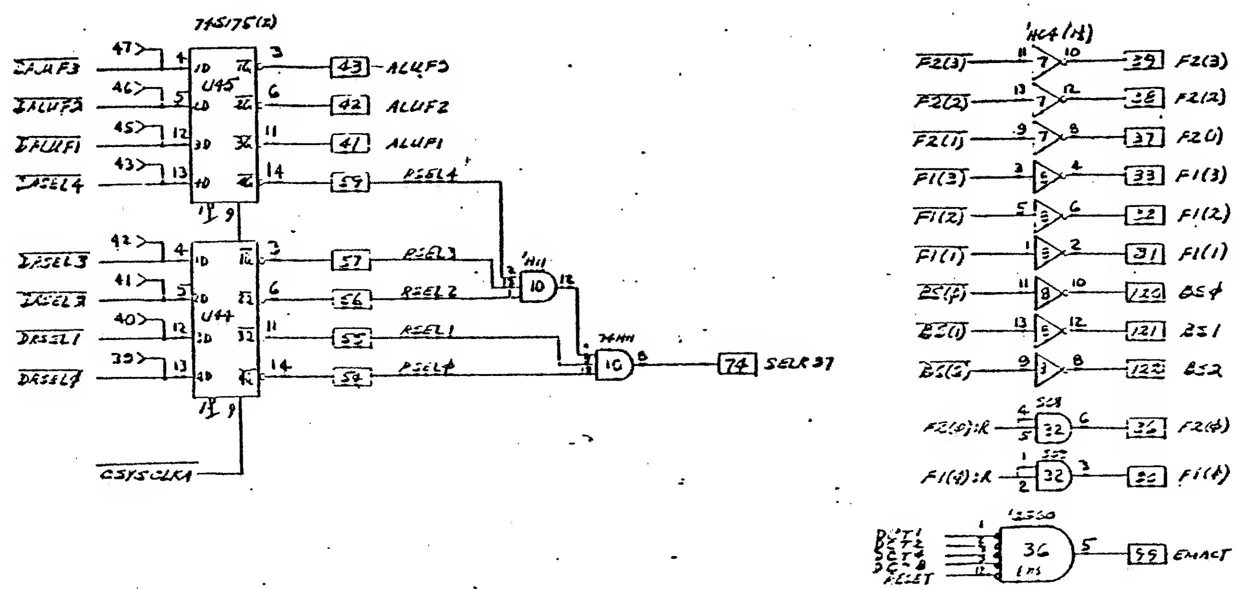

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ASSEMBLY, P. W. - CONTROL BOARD (2K) (EXTENDED MEMORY)

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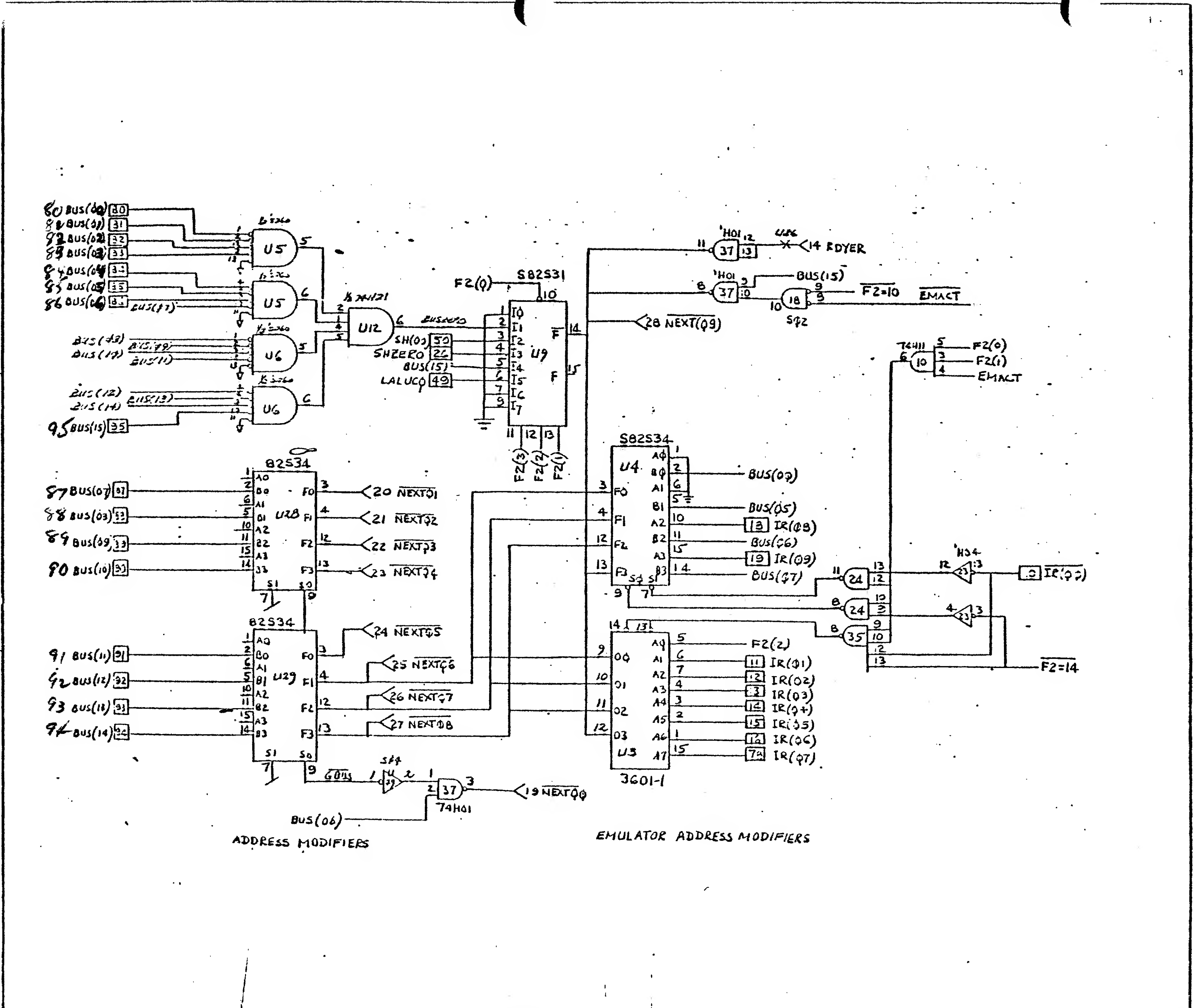

Title
ASSEMBLY, P. W. -
CONTROL BOARD (2K)
(EXTENDED MEMORY)

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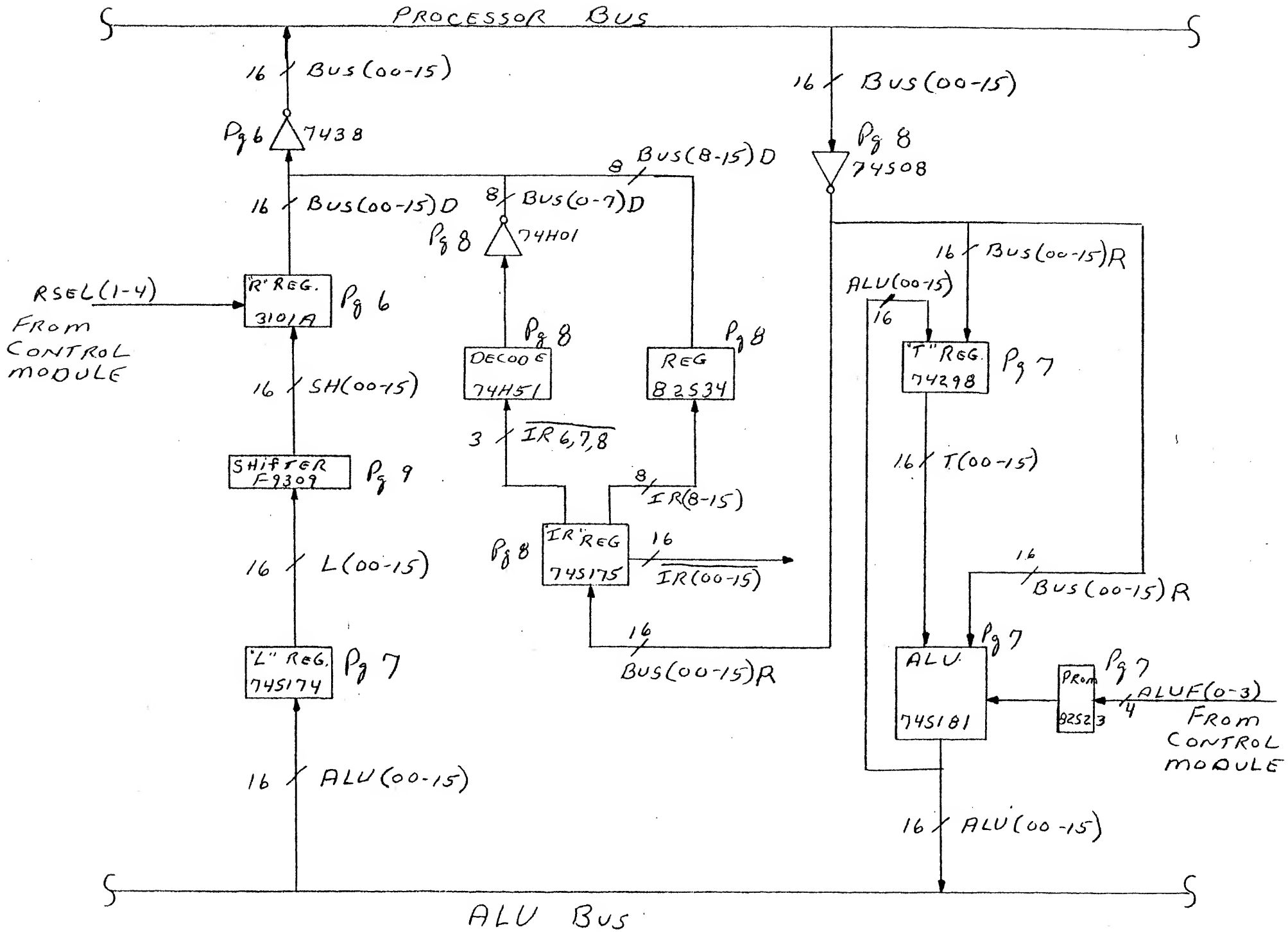
ARITHMETIC SECTION

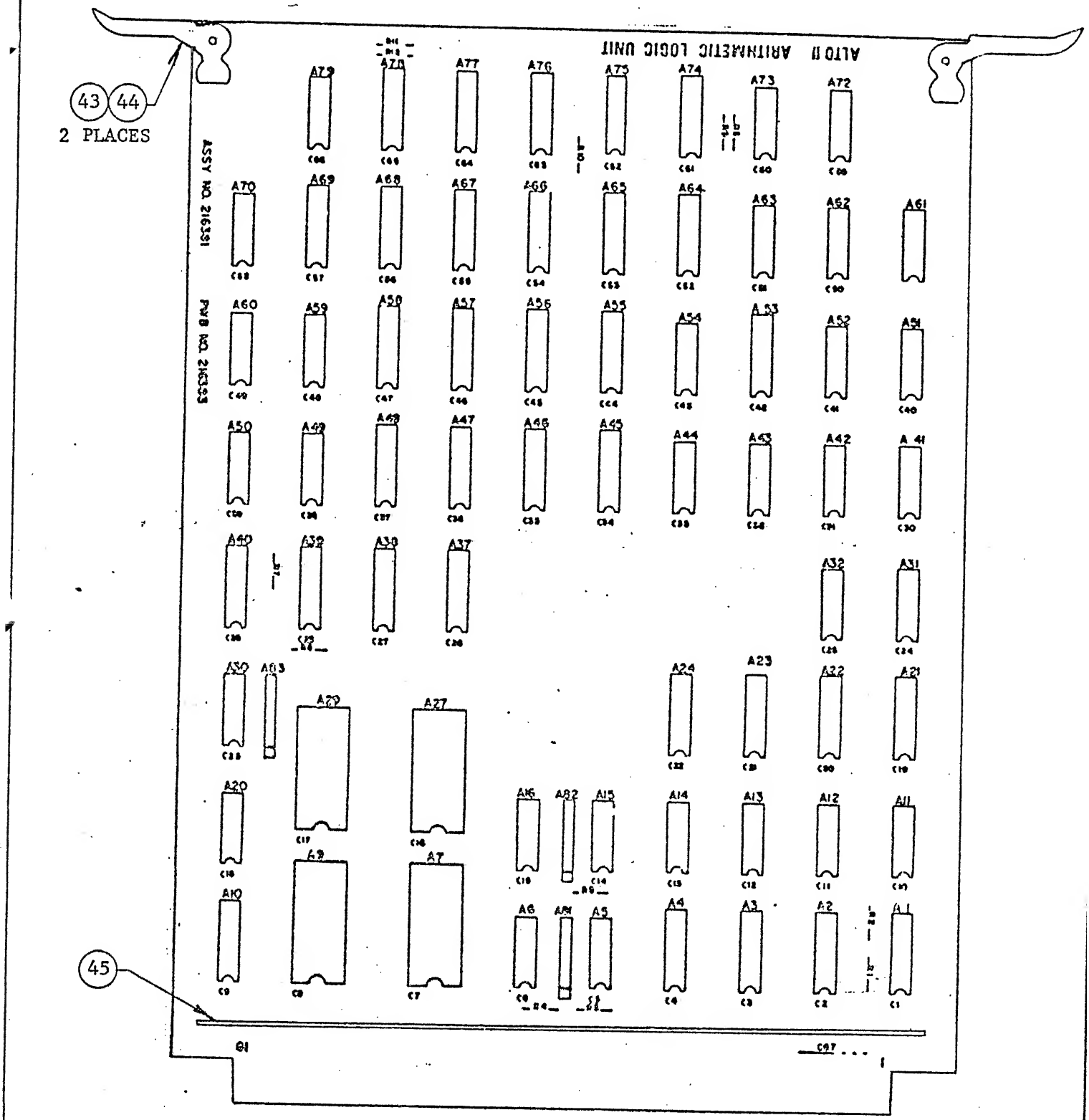
The arithmetic section of the processor consists of two 32-word by 16-bit register files R and S, and five registers, T, L, M, MAR, and IR. The registers are connected to the memory and to an ALU with a 16-bit parallel bus.

The ALU is a SN74181 type, restricted so that it can do only 16 arithmetic and logical functions. The ALU output feeds the L, M, and MAR registers. T may also be loaded from the ALU output under certain conditions. L is connected to a shifter capable of left and right shifts by one place, and cycles of 8. It has a mode in which it does the peculiar 17-bit shifts of the standard instruction set, and a mode which allows double-length shifts to be done.

The IR register is used by the emulator to hold the current emulated instruction.

ARITHMETIC LOGIC UNIT (ALU)





Title

ASSEMBLY, PRINTED WIRING-

ARITHMETIC LOGIC UNIT

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Material List

ML | Drawing No. 216381 | Rev. F

Rev. F | Drawing No. 216381 | ML

Drawing Title

ALTO II

ASSEMBLY, PRINTED WIRING-
ARITHMETIC LOGIC UNIT

Model No. EWO7YF92 | Date 3/5/76 | Sheet 4 Of

Item No.	Drawing Title	Drawing No.	No. Req.	Remarks
1	Board, P. W. - ALU	216383	1	
2	Procedure, Test	216382	REF	
3	Spec, Module Assembly	216207	REF	
4	Microcircuit, 74H00		4	A31,42,52,72
5	74H55		2	A43, 61
6	74H01		2	A44,54
7	74S02		2	A51,70
8	74H04		2	A20,30
9	74S08		4	A11,12,13,14
10	74S10		2	A41,79
11	74S30		4	A49,50,59,60
12	7438		4	A5,6,15,16
13	74H50		1	A63
14	74H51		1	A32
15	74H74		1	A73
16	7486		1	A62
17	74S133		1	A69
18	74S174		3	A37,38,39
19	74S175		4	A1,2,3,4
20	74S181		4	A7,9,17,19
21	74S182		1	A40
22	74298		4	A21,22,23,24
23				
24				
25	I3101A Intel		8	A45,46,55,56,65,66, 75,76
26	F9309 Fairchild		9	A47,48,53,57,58,67, 68,77,78
27	82S23 Signetics		1	A10
28	Microcircuit, 82S34 Signetics		2	A64,74
29				
30				
31	Capacitor, .05 uF, 10V		66	Centralab #UK10-503
32				C1 thru C66
34	Capacitor, 22uF, 15V, Tantalum	187720-005	1	C67

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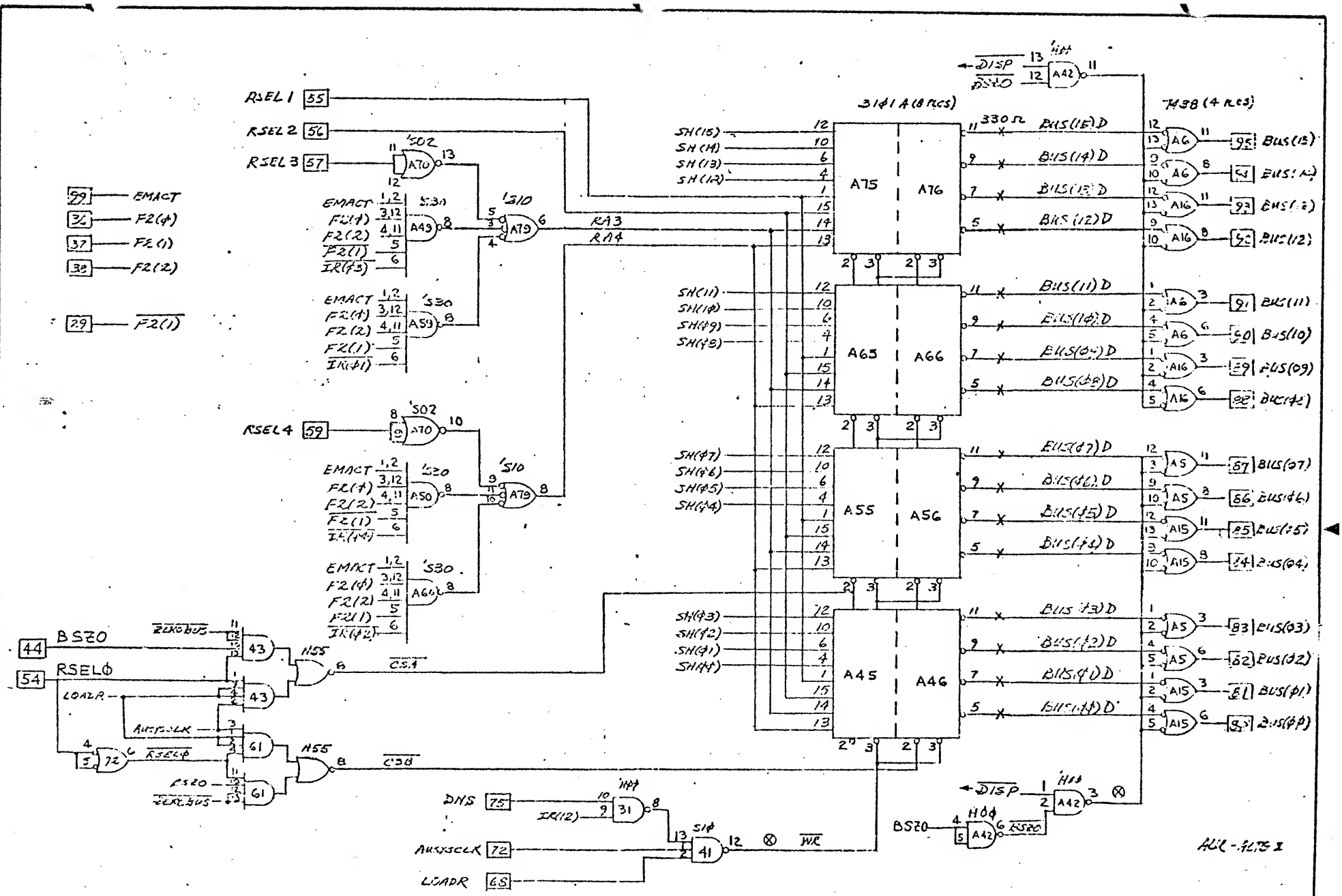
ARITHMETI C LOGIC UNIT

Model No. EWO 7YF92 | Date 3/5/76 | Sheet 5 Of

Drawing No. 216381 ML

Item No.	Drawing Title	Drawing No.	No. Req.	Remarks
34	Resistor, 1K, ±5%, 1/4W	116447-102	10	R1, 2, 4, 6, Thru 12
35	Resistor, 330Ω, ±5%, 1/4W	116447-331	2	R3, R5
36	Resistor Network (SIP)		3	CTS #750-81-R330Ω
37				
38	Socket, Microcircuit		30	Augat #514-AG11D
39	Socket, Microcircuit		33	Augat #516-AG11D
40	Socket, Microcircuit		4	Augat #524-AG11D
41				
42				
43	Rivet, Blind - Pull Thru	156111-005	2	
44	Extractor, Module	216250	2	
45	Stiffener	216242	1	



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ASSEMBLY, PRINTED WIRING-
ARITHMETIC LOGIC UNIT

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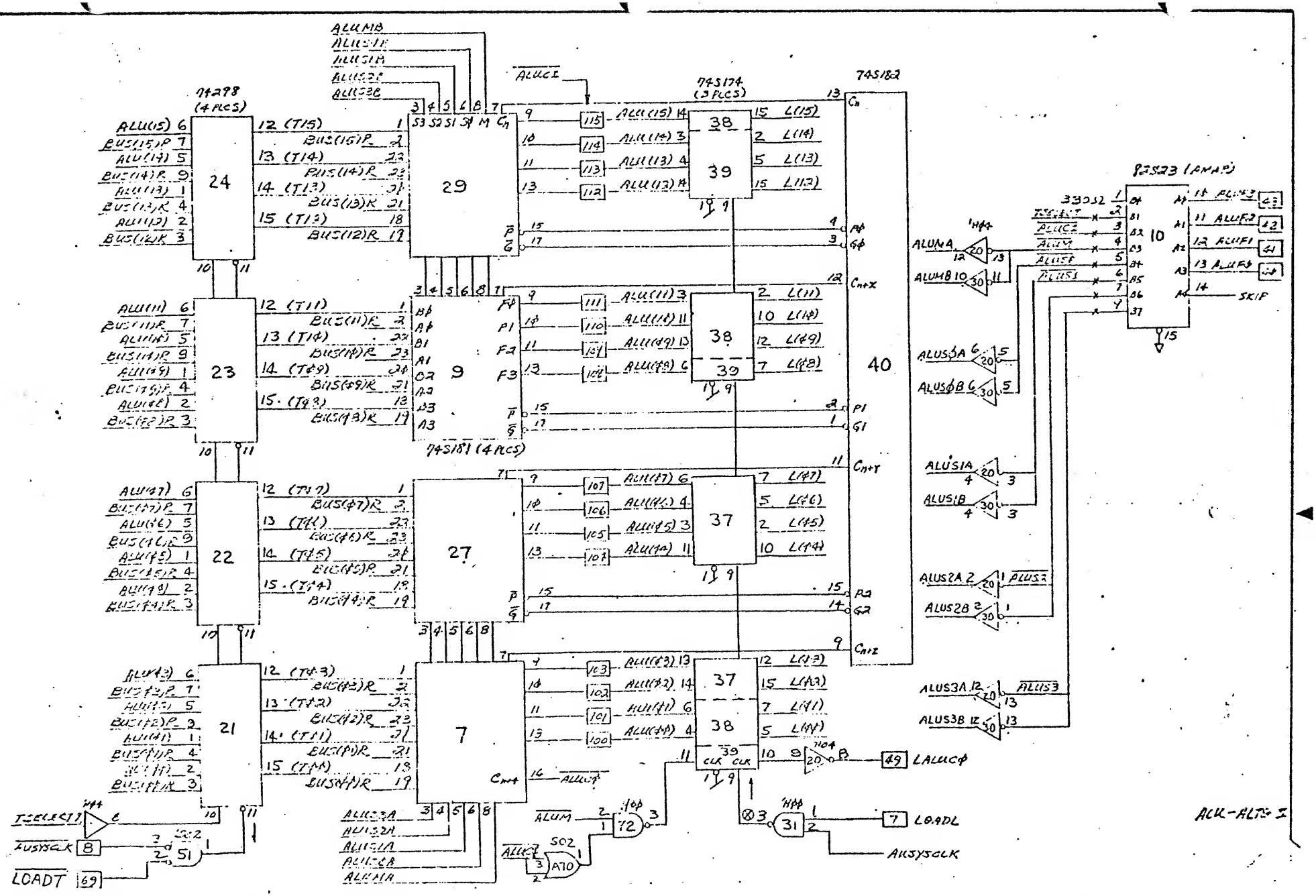

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ASSEMBLY PRINTED WIRING-
ARITHMETIC LOGIC UNIT

Xerox Corporation
El Segundo, California

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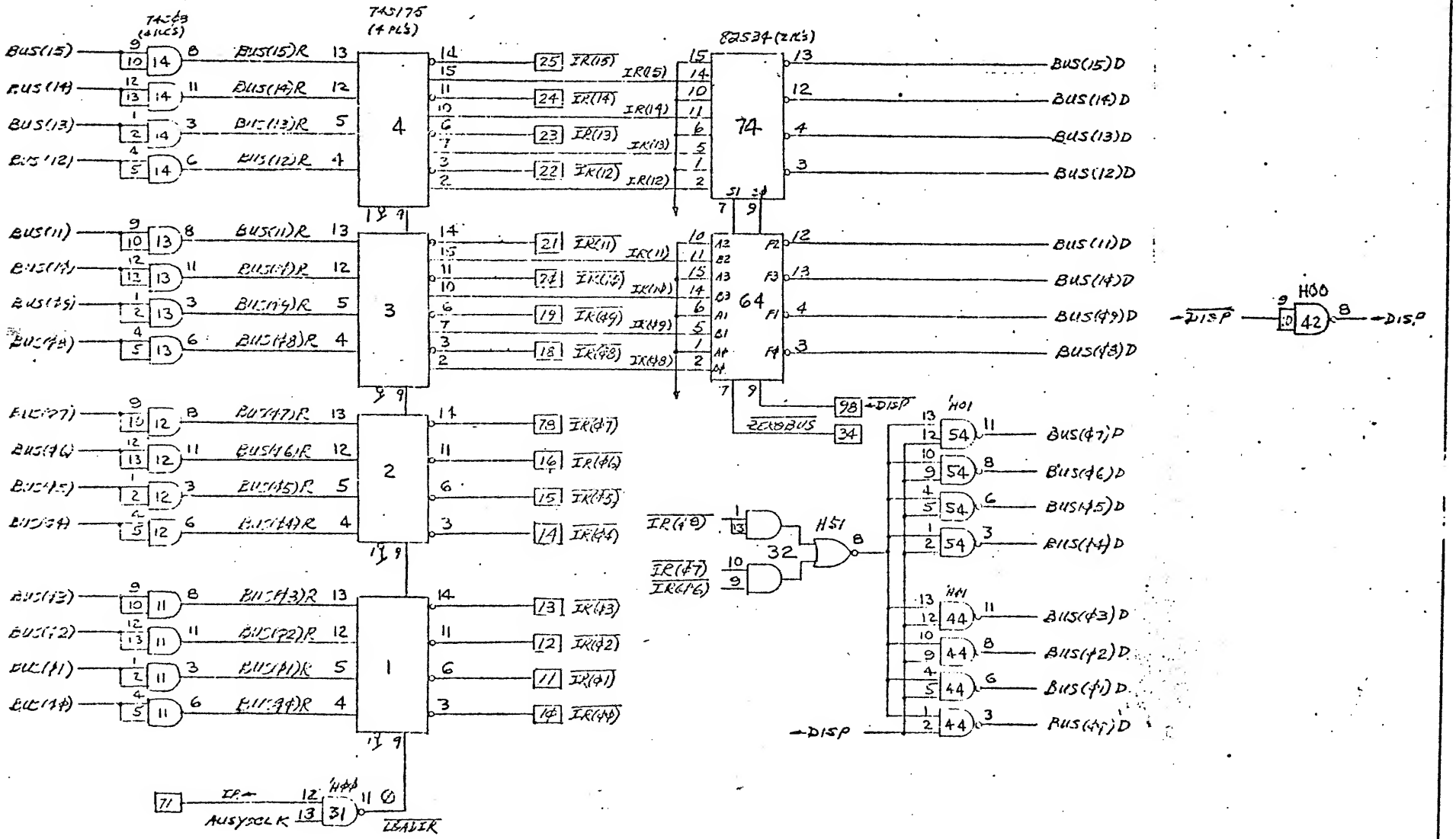

Title

ASSEMBLY, PRINTED WIRING- ARITHMETIC LOGIC UNIT

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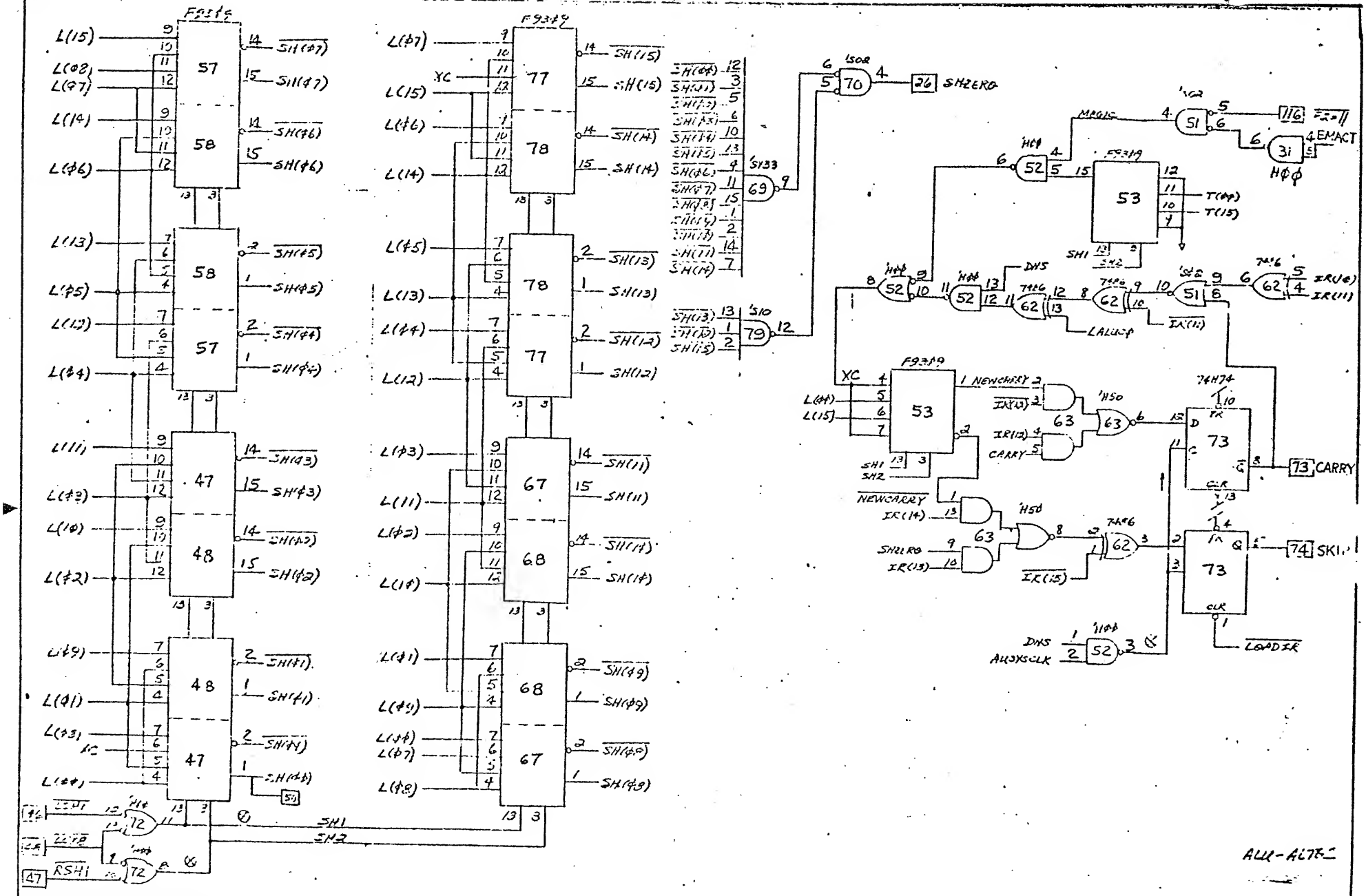

Title

ASSEMBLY, PRINTED WIRING-
ARITHMETIC LOGIC UNIT

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DISPLAY CONTROLLER

CHARACTERISTICS

The display controller handles transfers between the main memory and the CRT. The CRT is a standard 875 line raster-scanned TV monitor, refreshed at 60 fields per second from a bit map in main memory. The CRT contains 606 points horizontally, and 808 points vertically, or 489.648 points total.

The basic way in which information is presented on the display is by fetching a series of words from Alto main memory, and serially extracting bits to become the video signal. Therefore, 38 16-bit words are required to represent each scan line; 30704 words are required to fill the screen.

HARDWARE

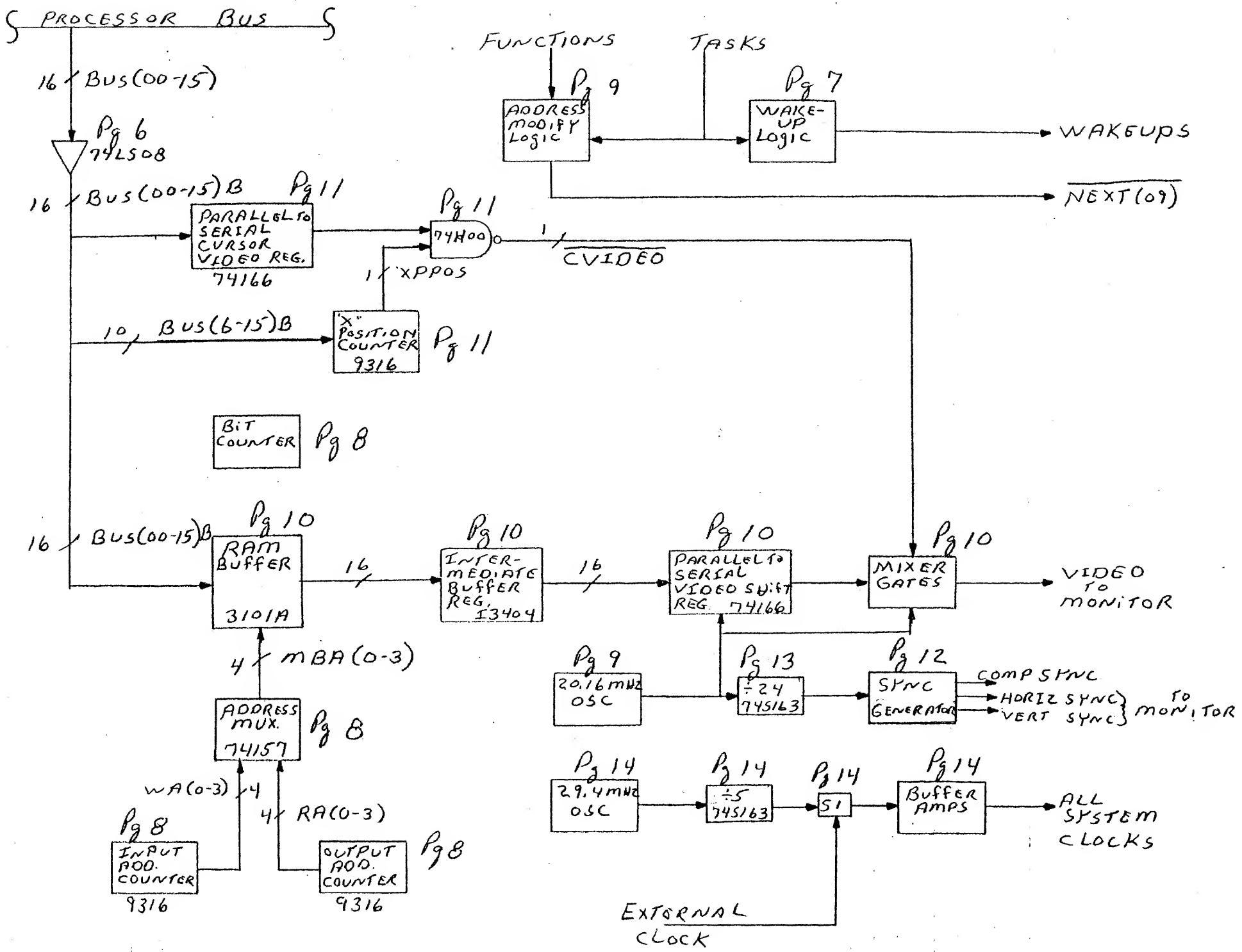
The display controller consists of a sync generator, a data buffer and serializing shift register, and three microcode tasks which control data handling and communicate with the Alto program. The Ram buffer is loaded from the Alto bus for the display word task DWT. The purpose of the intermediate buffer is to synchronize data transfers between the main buffer, which is synchronous with the 170 nsec. master clock, and the shift register, which is clocked with an asynchronous bit clock. The sync generator provides this clock and the vertical and horizontal synchronization signals required by the monitor.

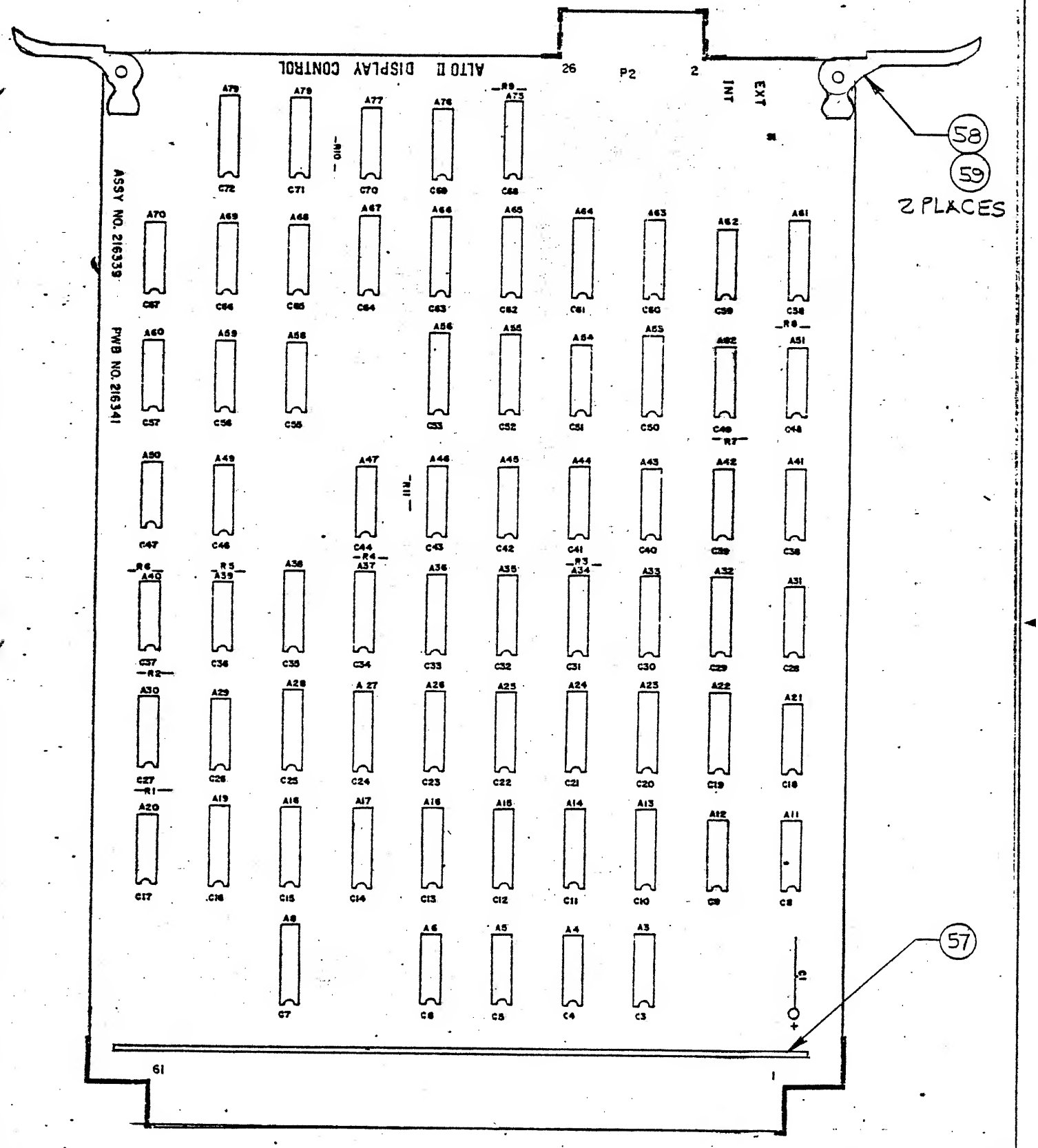
CURSOR

Because of the difficulty of inserting a cursor at the appropriate place in the display bit map at reasonable speed, a hardware cursor is included in the Alto. The cursor consists of an arbitrary 16 by 16 bit patch, which is merged with the video at the appropriate time. The coordinate origin for the cursor is the upper left hand corner of the screen. The cursor presentation is unaffected by changes in display resolution.

The cursor hardware consists of a 16-bit shift register which holds the information to be displayed on the current scan line, and a counter which is incremented by the bit clock, and determines the x coordinate and bit map segment from the R memory into the hardware.

DISPLAY CONTROL MODULE





Title
ASSY, PRINTED WIRING
DISPLAY CONTROL

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Material List

ML	Drawing No. 216339	Rev. E

Drawing Title
ALTO II

ASSEMBLY, PRINTED WIRING-
DISPLAY CONTROL

Model No.	Date	Sheet
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Drawing No. 216339 ML

Item No.	Drawing Title	Drawing No.	No. Req.	Remarks
1	Board, P.W., Display Control	216341	1	
2	Procedure, Test	216340	REF	
3	Spec, Module Assembly	216207	REF	
4	Microcircuit, 74H00		4	A29,30,43,58
5	74H01		1	A40
6	74H04		1	A42
7	74H08		1	A31
8	74H10		1	A21
9	74H11		2	A11,12
10	74H21		1	A46
11	74H30		1	A76
12	74H50		1	A52
13	74H74		3	A44, 45, 47
14	74157		1	A35
15	74166		4	A17,22,28,32
16	74174		2	A18,64
17	74279		1	A19
18	74298		1	A56
19	74S02		2	A20,50
20	74S04		4	A41,49,62,70
21	74S10		1	A59
22	74S163		3	A61,78,79
23	74LS08		4	A3,4,5,6
24	74S08		1	A39
25	74S74		1	A68
26	Microcircuit, 74S00		1	A69
27	MICROCIRCUIT, 74109		1	A8
28				
29				
30	Microcircuit, 13101A Intel		4	A14,15,24,25
31	Microcircuit, 13404 Intel		3	A13,23,34
32				
33				

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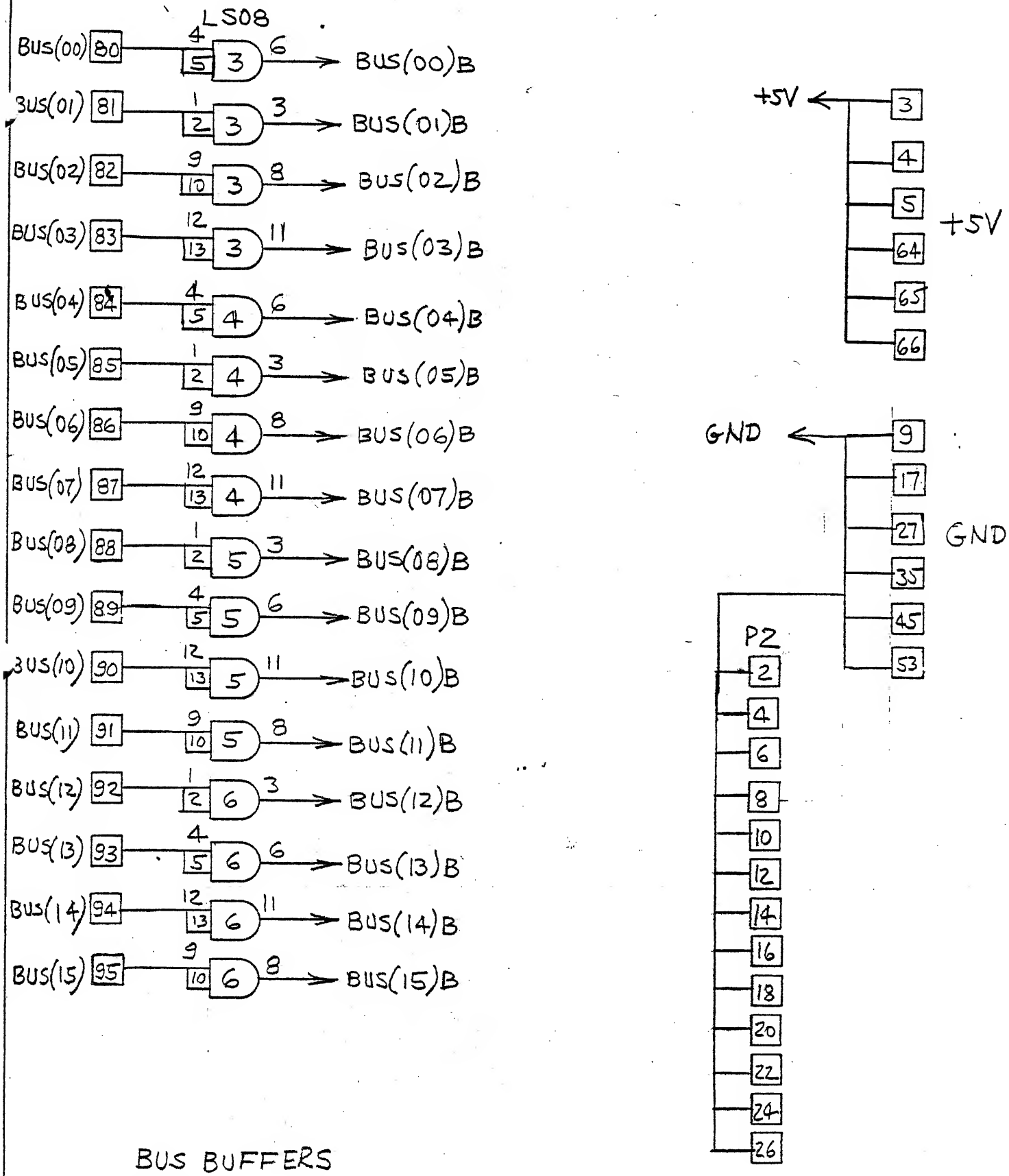
DISPLAY CONTROL

Model No. EWO 7YF92 | Date 3/4/76 | Sheet 5 Of

Drawing No. 216339 ML

Item No.	Drawing Title	Drawing No.	No. Req.	Remarks
34	Microcircuit, MC3026 Motorola		2	A54,77
35	K1091A Motorola		1	OSC 20.16MHZ A60
36	K1100A Motorola		1	OSC 29.40 MHZ A51
37	S82S23 Signet		1	2.56 PROM A63
38	P3601-1 M.I.L.		2	A38,66
39	F9316 Fairchild		9	A16,26,27,36,37, 55,65,67,75
40	Microcircuit, 898-1-330 Beckman		2	A33,53
41				
42				
43				C55 Thru 72
44				C3 Thru 44,46 Thru 53
45	Capacitor, .05 uF, 10V		68	Centralab #UK-10-503
46	Capacitor, Tant. 22 uF, 15V	187720-005	1	C1
47				
48				
49				
50	Resistor, 330Ω, ±5%, 1/4W	116447-331	7	R1,2,3,5,6,7,11
51	Resistor, 1K, ±5%, 1/4W	116447-102	5	R4,8,9,10,12
52				
53				
54	Switch		1	Contrl Sw # T8201
55	Socket, Microcircuit		34	Augat #514-AG11D
56	Socket, Microcircuit		34	Augat #516-AG11D
57	Stiffener	216242	1	
58	Extractor, Module	216250	2	
59	Rivet	156111-005	2	



BUS BUFFERS

Title
ALTO II
ASSEMBLY, P.W.-
DISPLAY CONTROL

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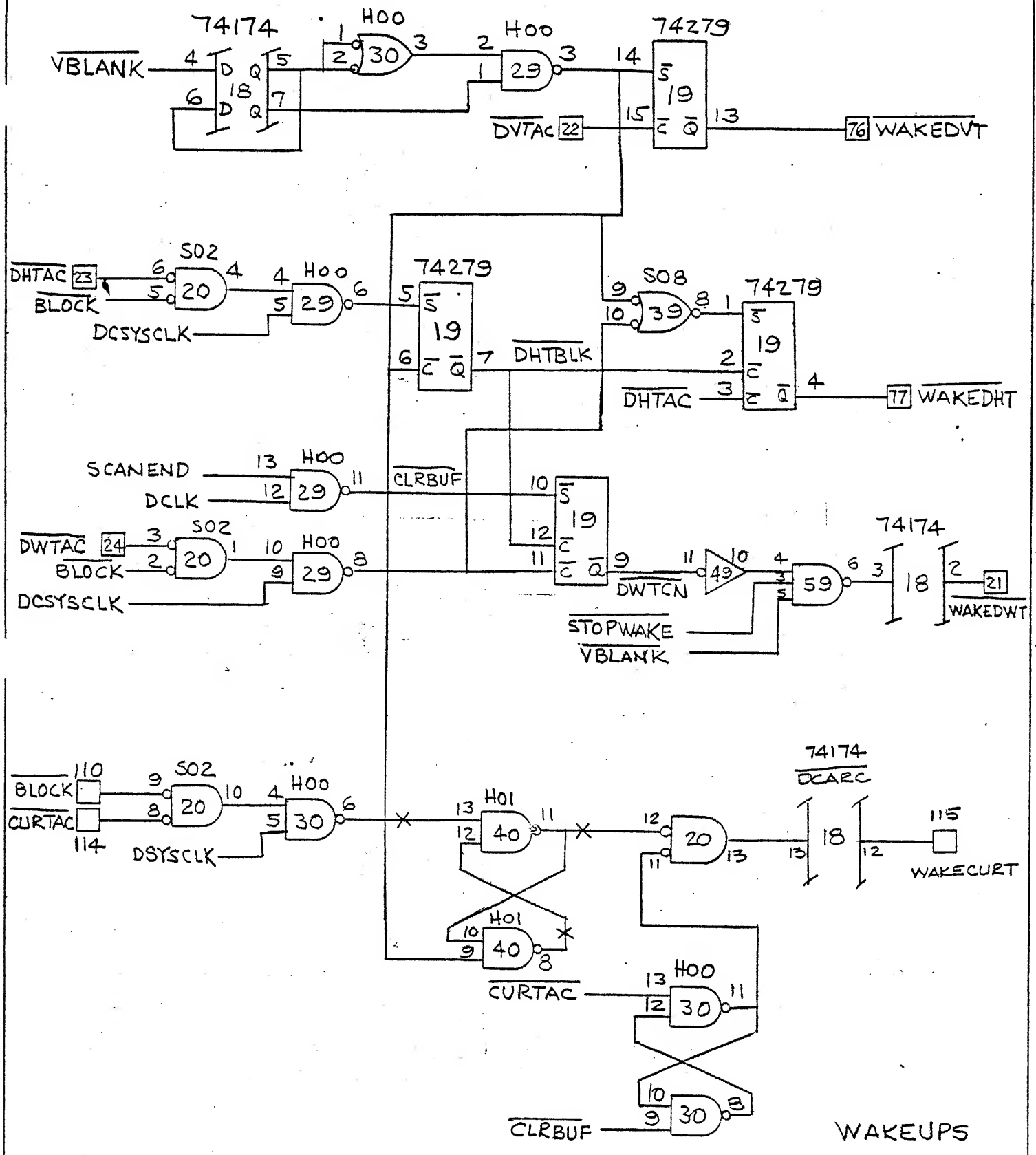

Title

ALTO II

ASSEMBLY, P.W.- DISPLAY CONTROL

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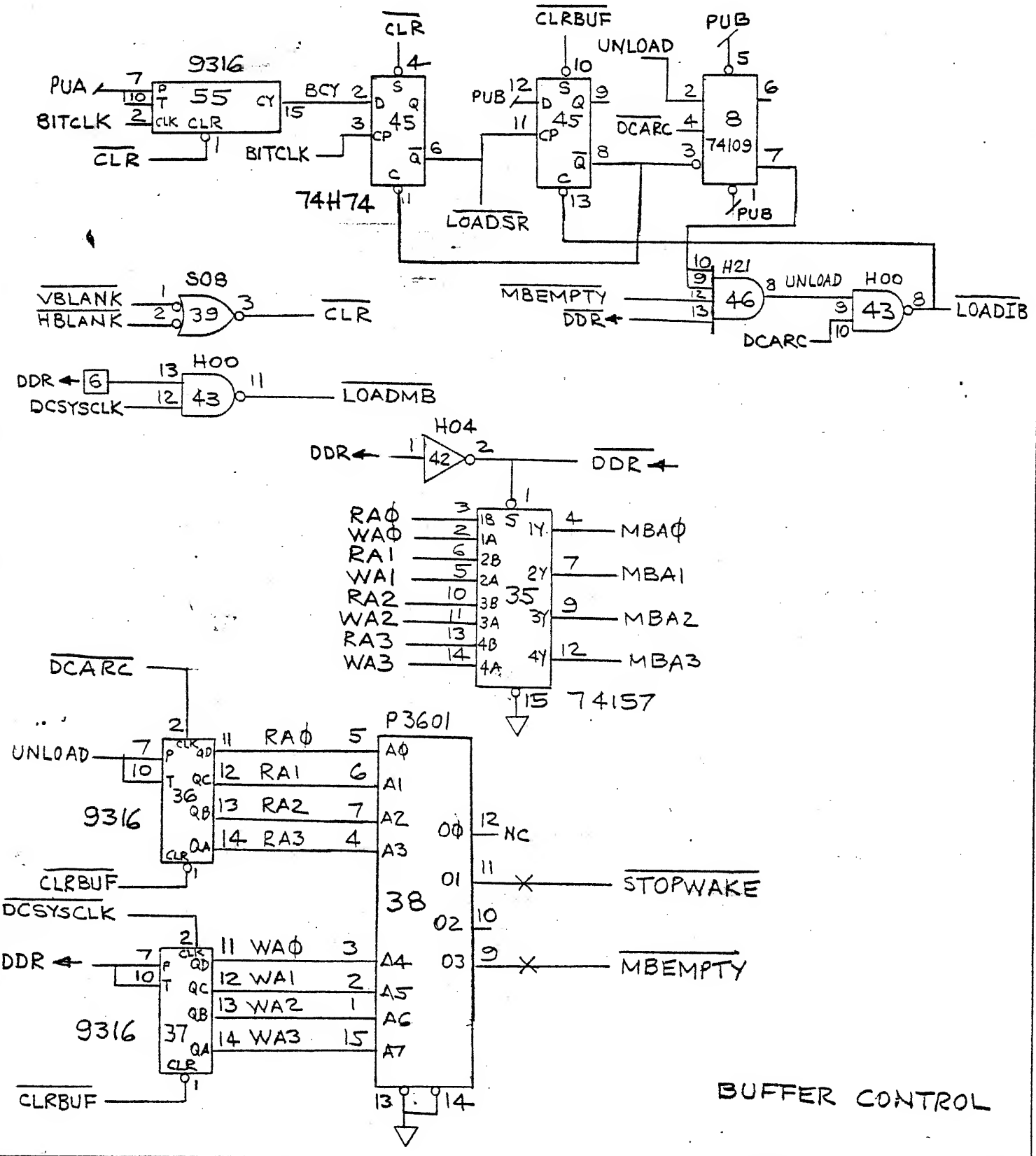

Title
ALTO II
ASSEMBLY, P.W.-
DISPLAY CONTROL

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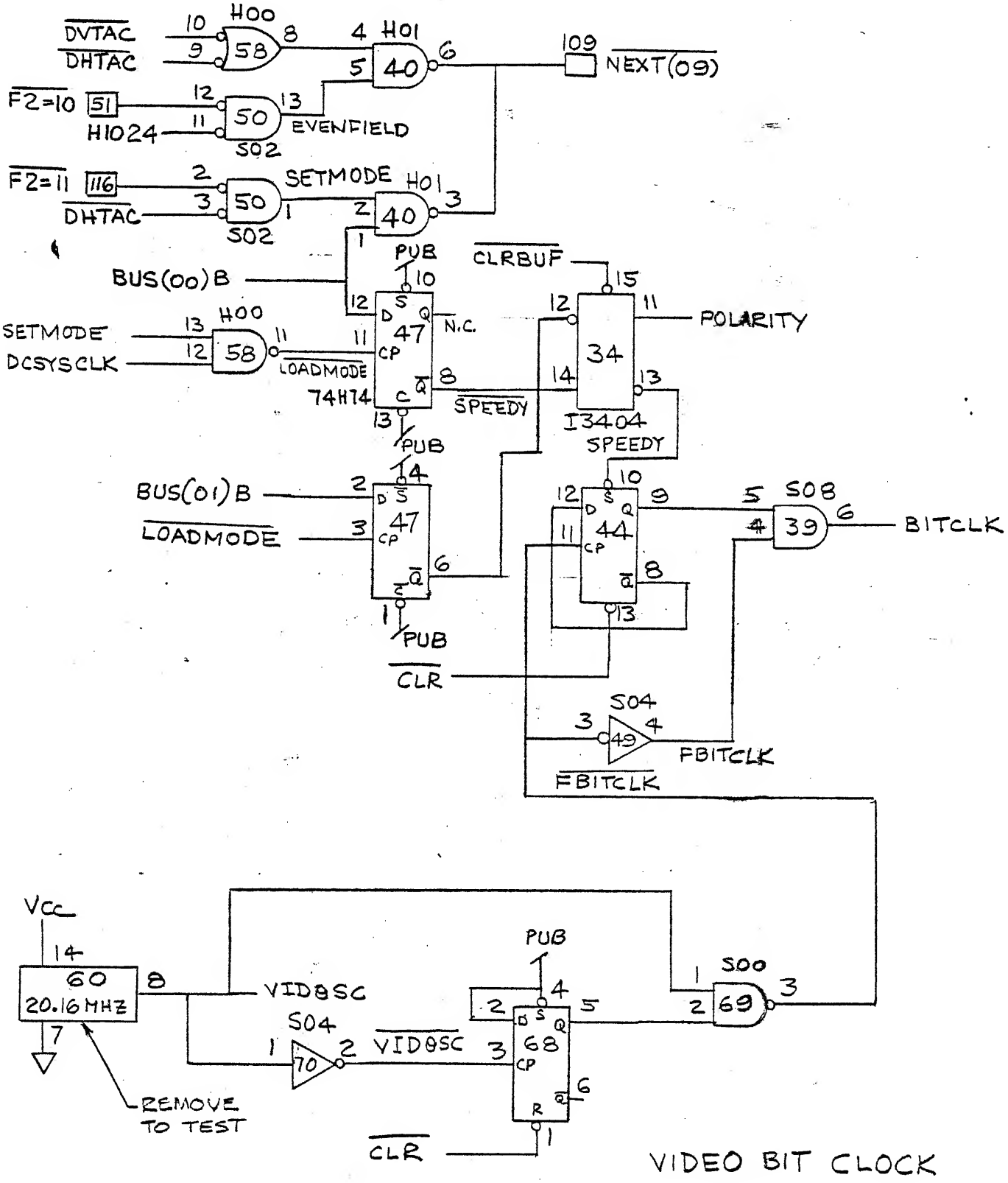

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ALTO II

ASSEMBLY, P.W.-
DISPLAY CONTROL

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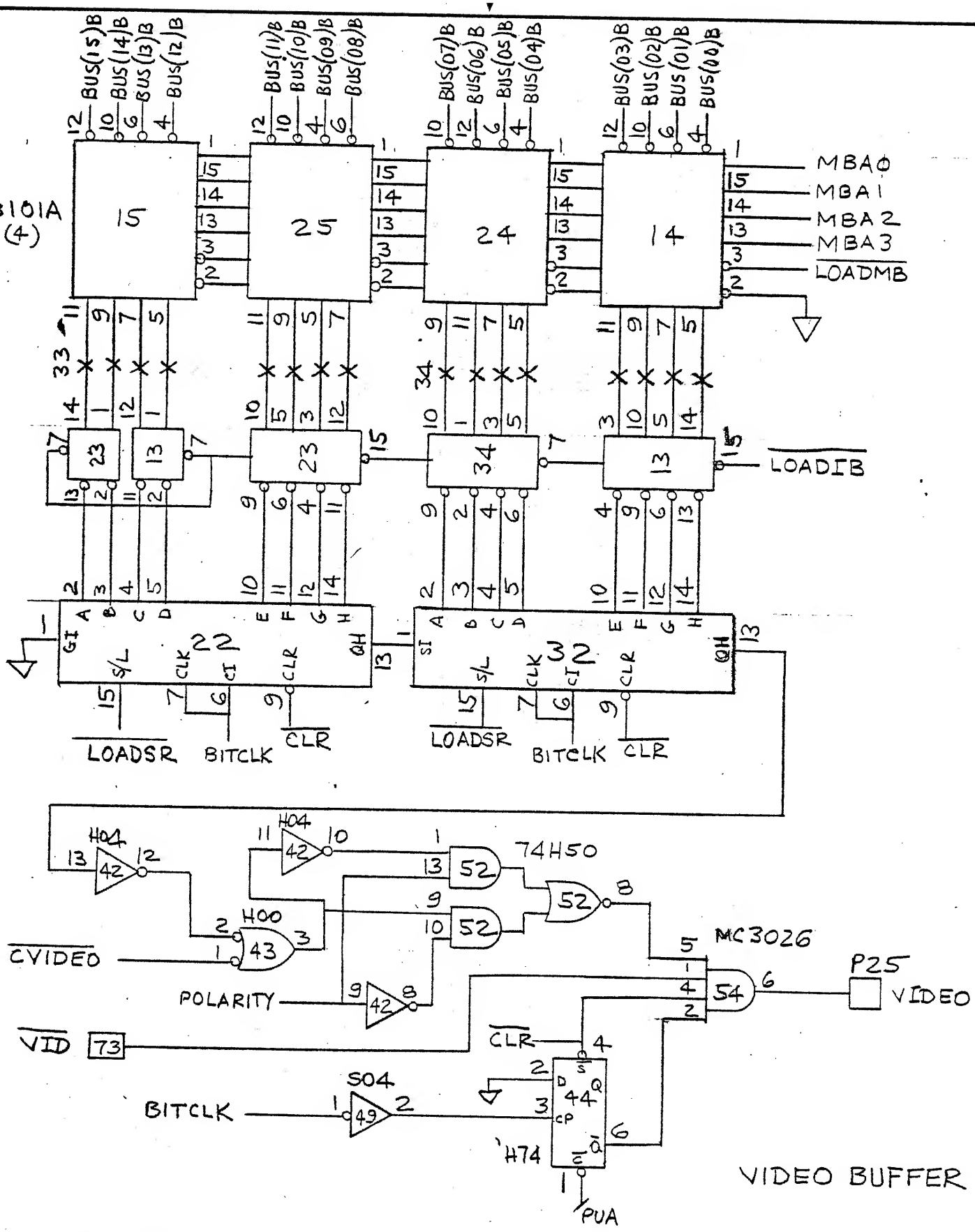

Title

ALTO II

ASSEMBLY, P.W.-

DISPLAY CONTROL

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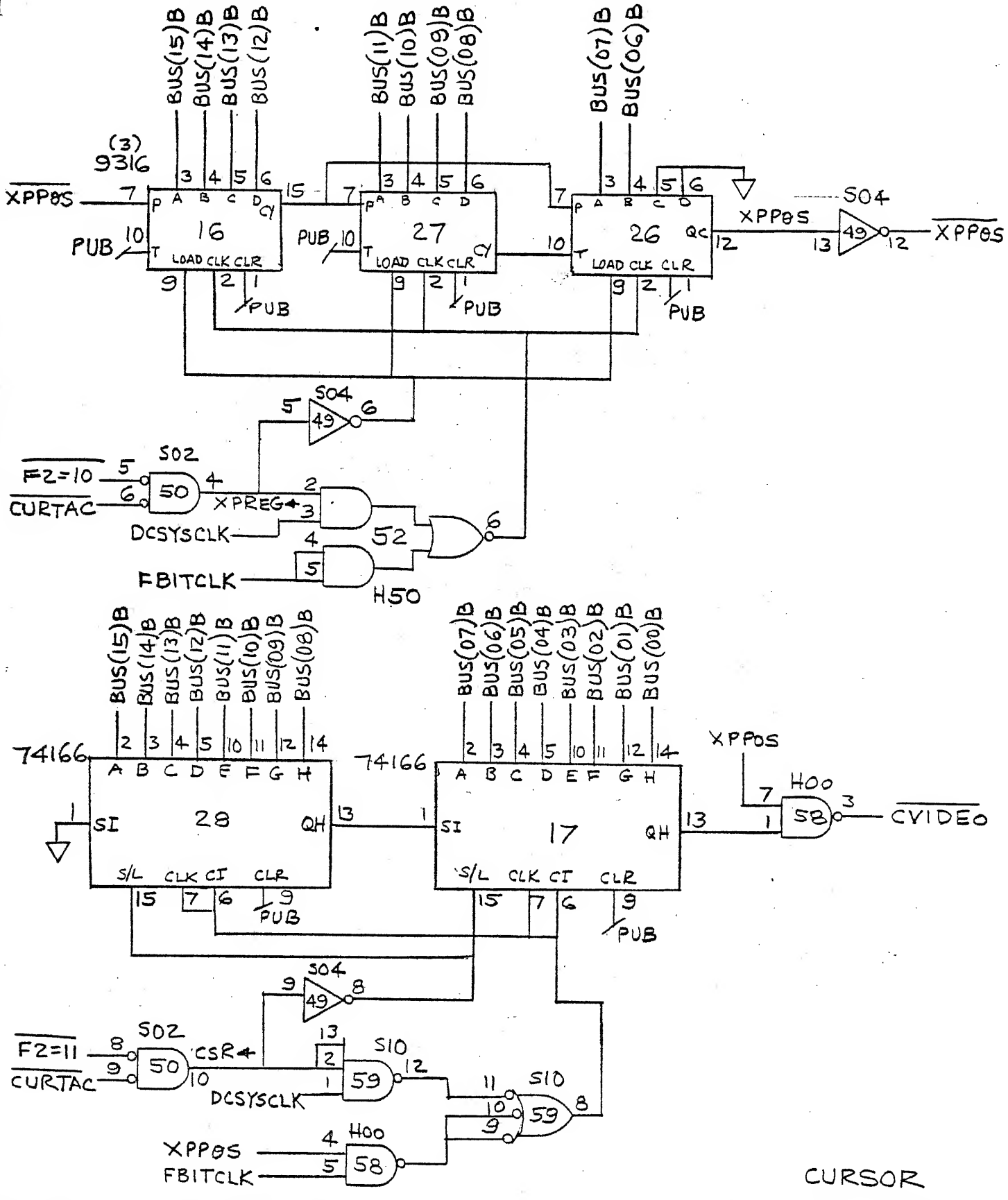

Title: ALTO II
ASSEMBLY, P.W.-
DISPLAY CONTROL

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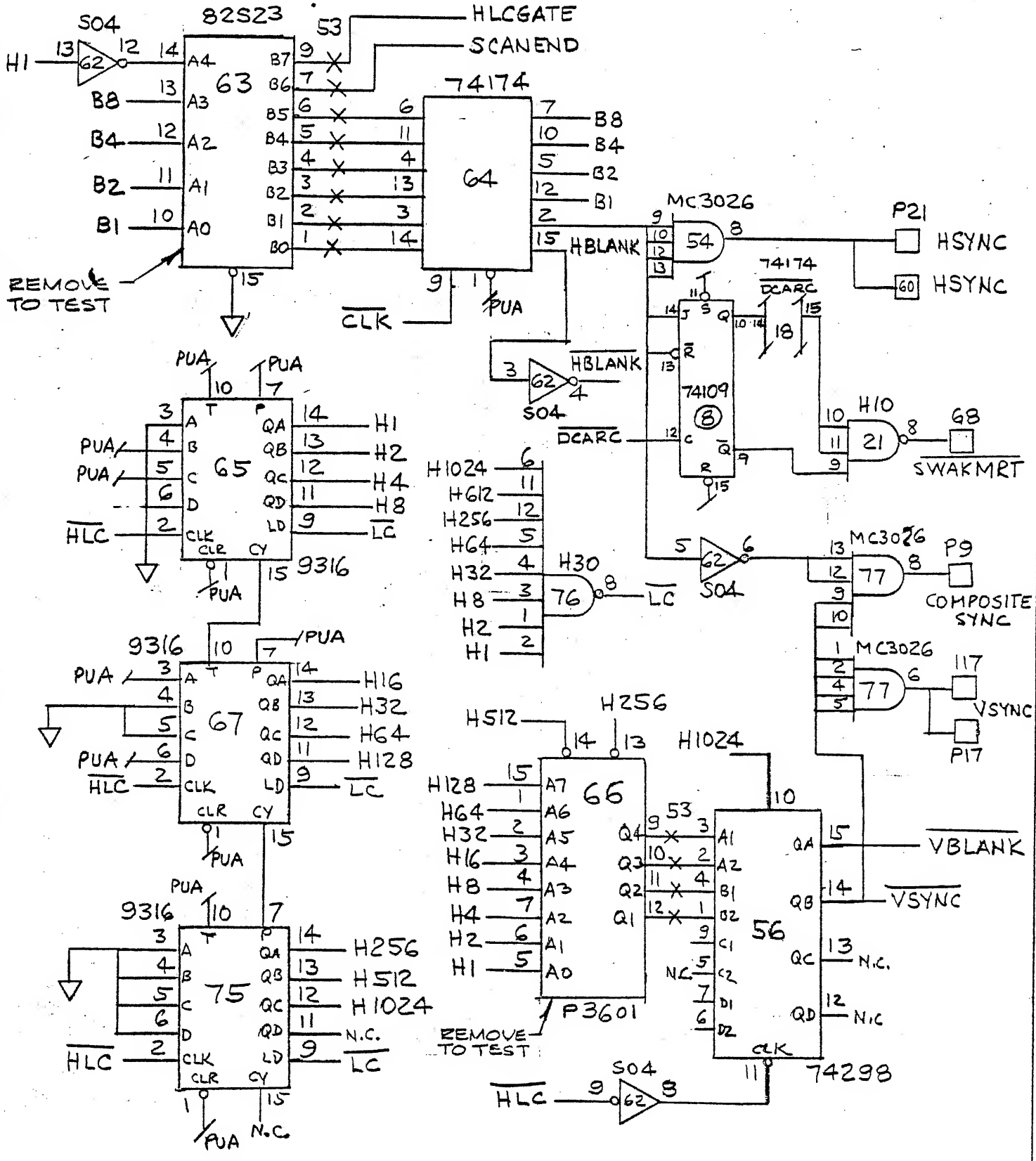

Title

ALTO II
ASSEMBLY, P.W.-
DISPLAY CONTROL

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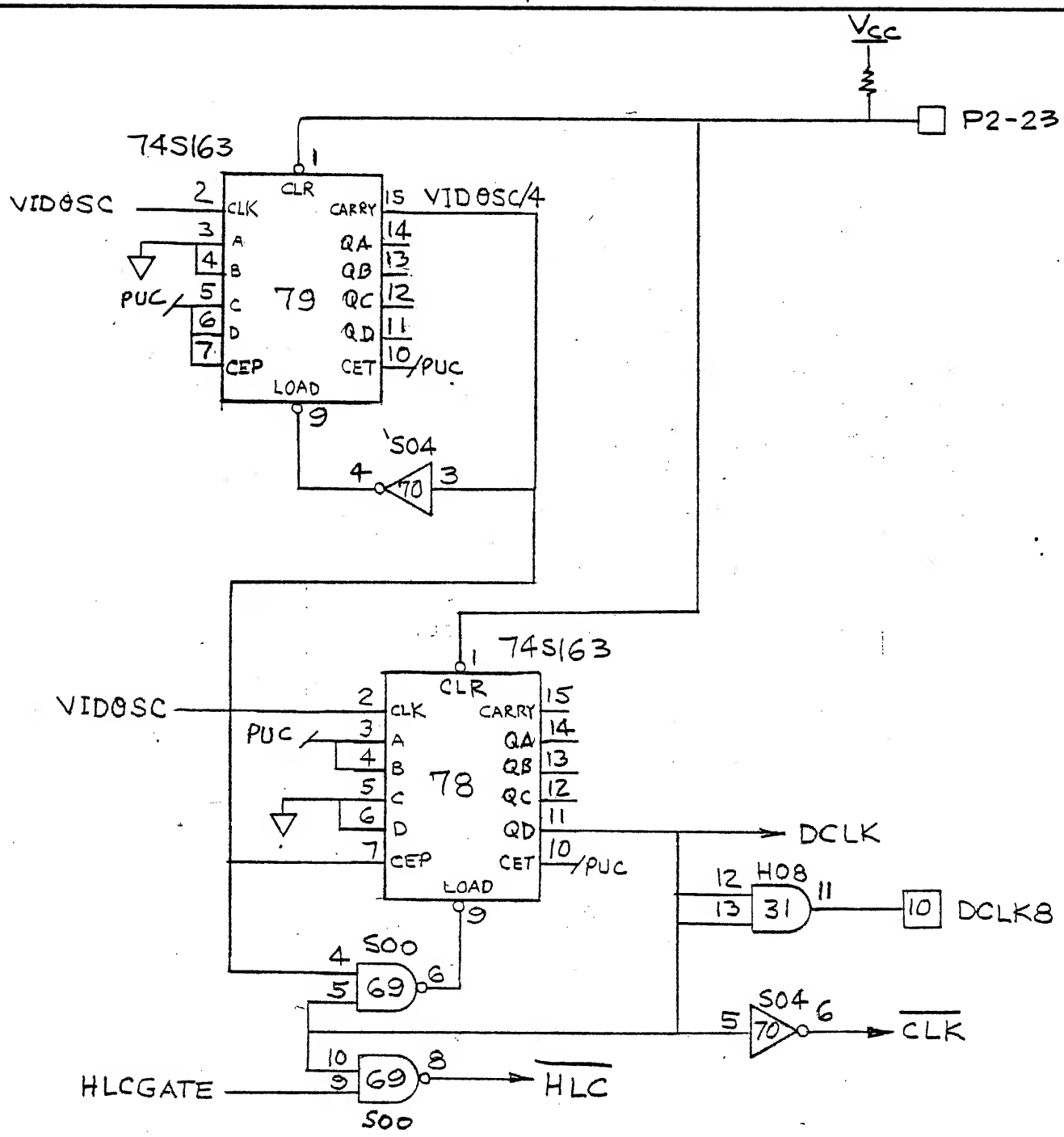

Title
ALTO II
ASSEMBLY, P.W. -
DISPLAY CONTROL

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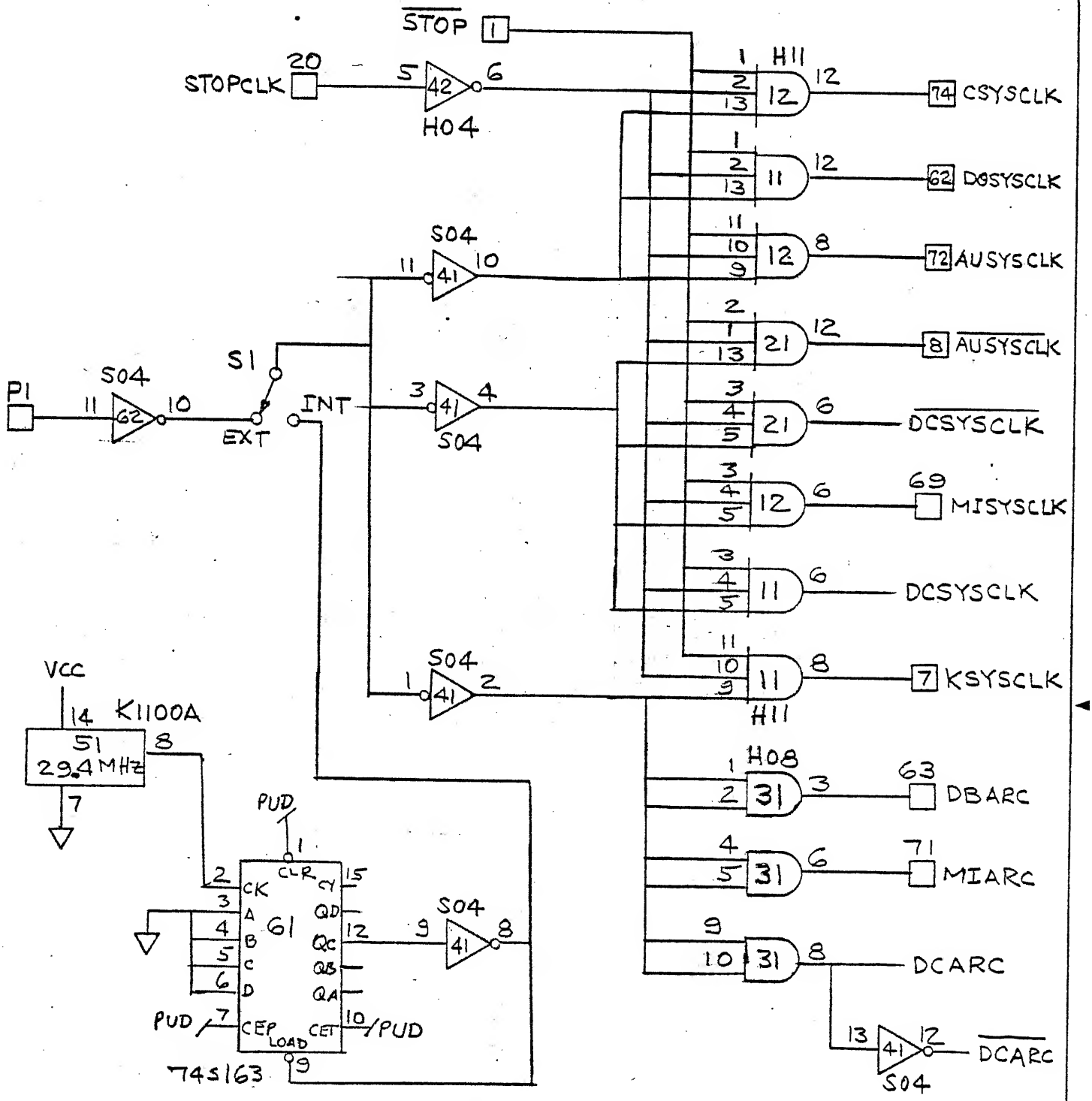

Title
ALTO II
ASSEMBLY, P.W.-
DISPLAY CONTROL

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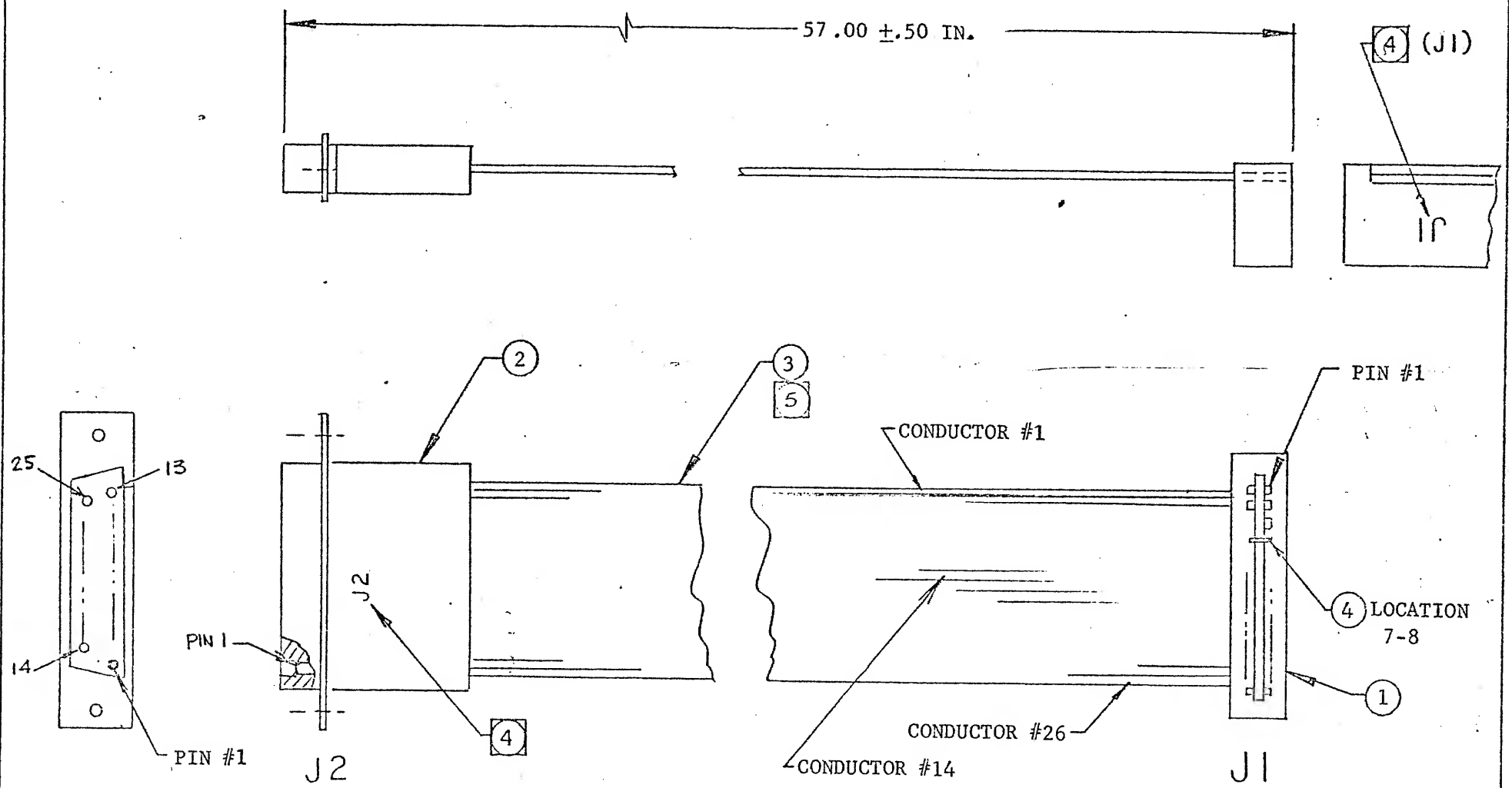
1586(3/73)



Title

ALTO II

ASSEMBLY, CABLE -DISPLAY

(INTERNAL)

Xerox Corporation
El Segundo, California

XEROX

216412 C

Sheet 3 Of 5

Wire No.	Term	From	To	Term	Wire Type	Notes	Signal	Chg. Let.
1		J2 - 13	J1 - 1		3			
2		25	2					
3		12	3					
4		24	4					
5		11	5					
6		23	6					
7		10	7					
8		22	8					
9		9	9					
10		21	10					
11		8	11					
12		20	12					
13		7	13					
14		—	14			(5)		
15		19	15					
16		6	16					
17		18	17					
18		5	18					
19		17	19					
20		4	20					
21		16	21					
22		3	22					
23		15	23					
24		2	24					
25		14	25					
26		J2 - 1	J1 - 26		3			

1. Ref Item No's in Applicable Material List.
2. Ref Designations Are Abbreviated. Prefix Each Designation With:

Title: ALTO II

ASSEMBLY, CABLE - DISPLAY (INTERNAL)

Xerox Corporation
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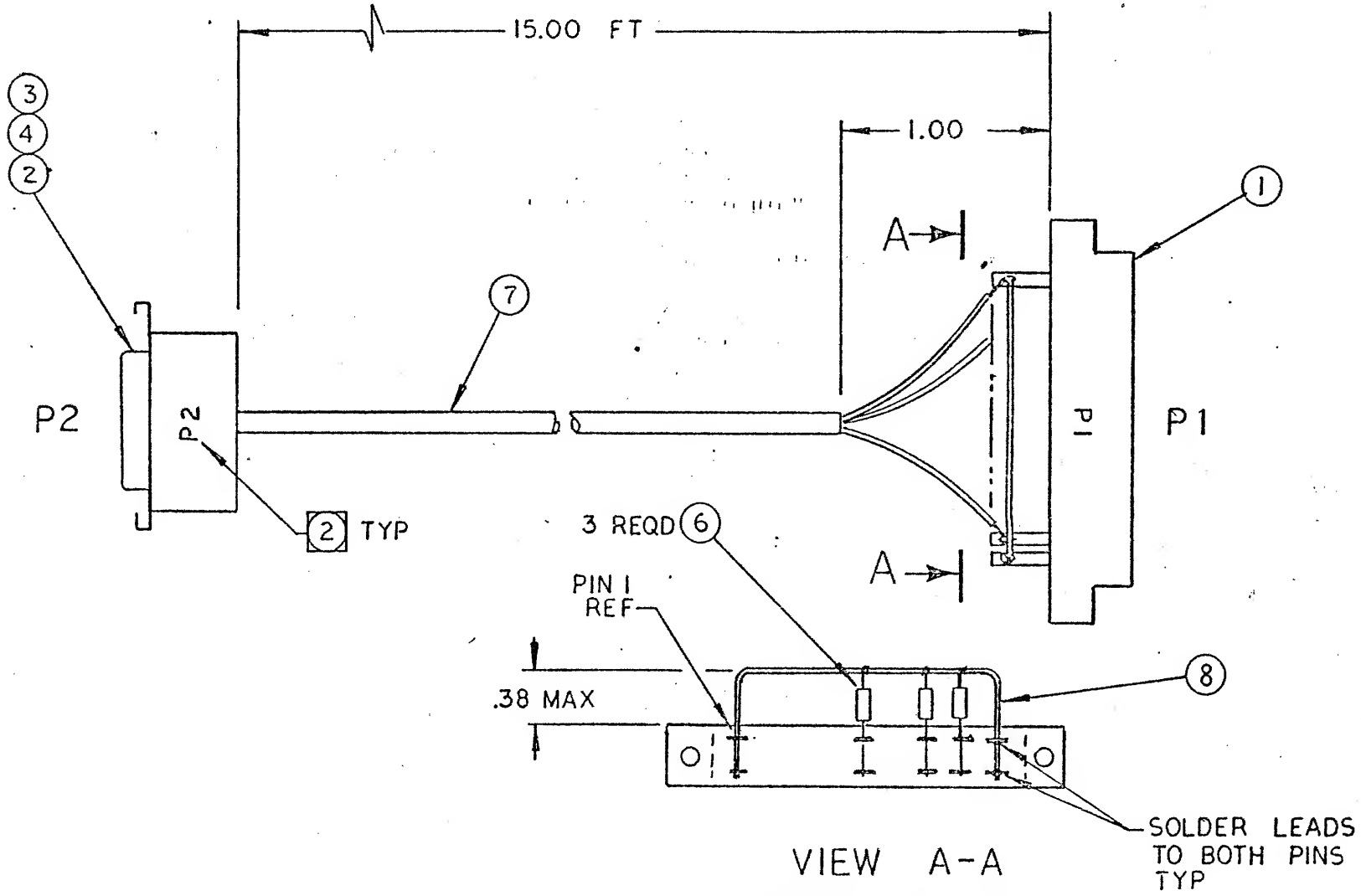
Sheet 5 of 5

566(3773)



VIEW A-A

ROTATED CCW 90°

WIRES NOT SHOWN FOR CLARITY

Title

ALTO II

ASSEMBLY, CABLE - DISPLAY (EXTERNAL)

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C

Sheet 3 Of 5

Wire No.	Term	From	To	Term	Wire Type	Notes	Signal	Chg. Let
1		P1 - A	P1 - 1		8			
2		1	10		8			
3		10	L		8			
4		6	BUS		6			
5		8	BUS		6			
6		9	P1 - BUS		6			
7		F	P2 - 16		7	WHT } TWISTED	HORIZONTAL SYNC	
8		BUS	3			BLK } PAIR		
9		J	14			GRN } TWISTED	VIDEO	
10		BUS	1			BLK } PAIR		
11		K	18			RED } TWISTED	VERTICAL SYNC	
12		P1 - BUS	P2 - 5		7	BLK } PAIR		

1. Ref Item No's in Applicable Material List.
2. Ref Designations Are Abbreviated. Prefix Each Designation With:

Title

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ASSEMBLY, CABLE - DISPLAY

(EXTERNAL)

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Sheet 5 Of 5

NOTES: UNLESS OTHERWISE SPECIFIED

1. ASSEMBLE PER MODULE ASSEMBLY SPEC, DWG NO. 216207.

(2) MAY BE PURCHASED FROM STANDARD WIRE & CABLE COMPANY, EL SEGUNDO, CALIFORNIA. VENDOR PART NO.

(3) MAY BE PURCHASED FROM CTS CORPORATION, ELKHART, INDIANA. VENDOR PART NUMBER US104L.

(4) MAY BE PURCHASED FROM ROGAN CORPORATION, NORTHBROOK, ILLINOIS. VENDOR PART NUMBER SC-10, BLACK, .140" x .093".

(5) AFTER SOLDERING, TRIM "R1" RESISTOR LEADS ON ETCH SIDE AS CLOSE TO THE PRINTED WIRING BOARD AS POSSIBLE AND ADHERE APPROX 1.0" LENGTH OF TEFLON TAPE (ITEM 11) OVER TRIMMED LEADS.

(6) TAG LOOSE ENDS OF CABLE AS TO THEIR DESTINATIONS PER WIRE LIST.

(7) INSTALL ITEM 4 TO ITEM 3 USING SUITABLE ADHESIVE.

WIRE LIST

WIRE NO.	FROM	TO (6)	WIRE TYPE	NOTES
1	PWB - 1	J1 - PIN C	9	YELLOW
2	PWB - 2	J1 - PIN D	8	BLUE
3	PWB - 3	J1 - PIN B	7	ORANGE

Title: ASSEMBLY, PRINTED WIRING DISPLAY INTENSITY CONT.

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216583 A

Sheet 2 Of 4

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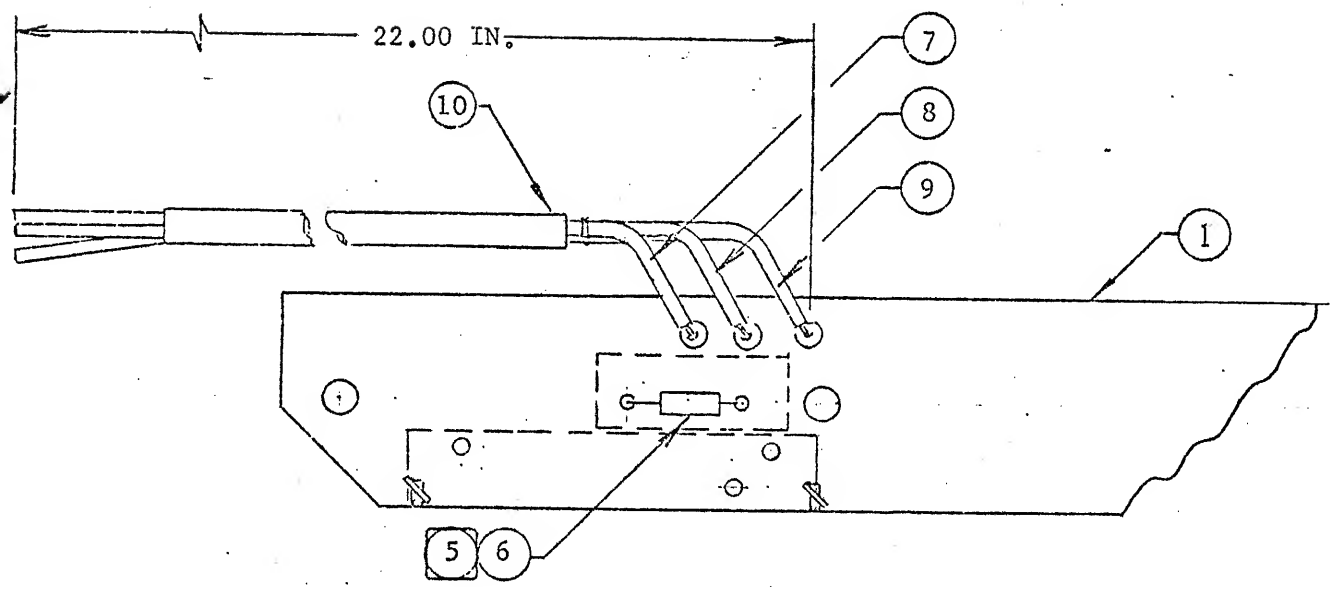

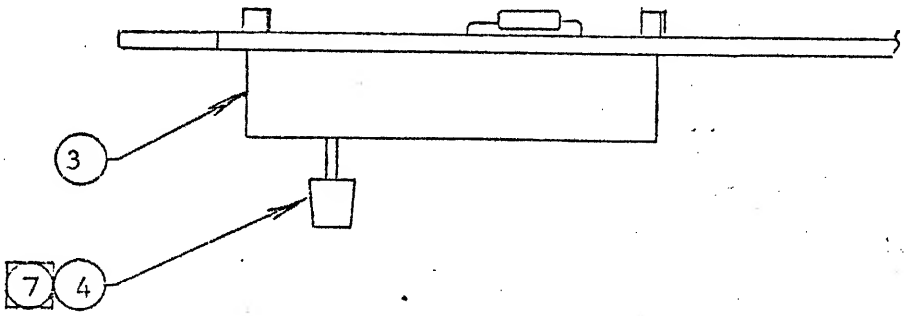

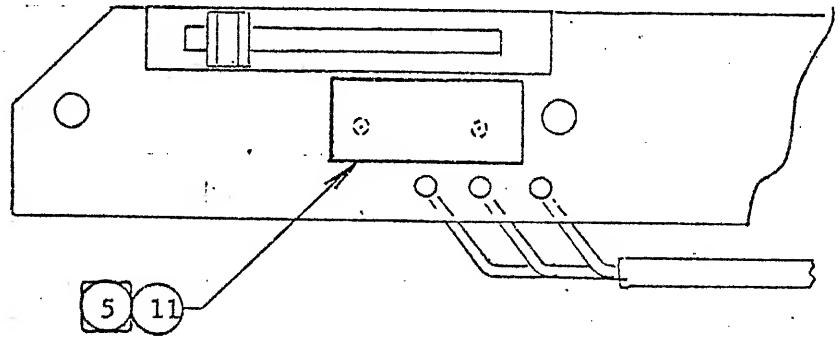

Title
ASSY, PRINTED WIRING-
DISPLAY INTENSITY
CONTROL

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Sheet 3 Of 4

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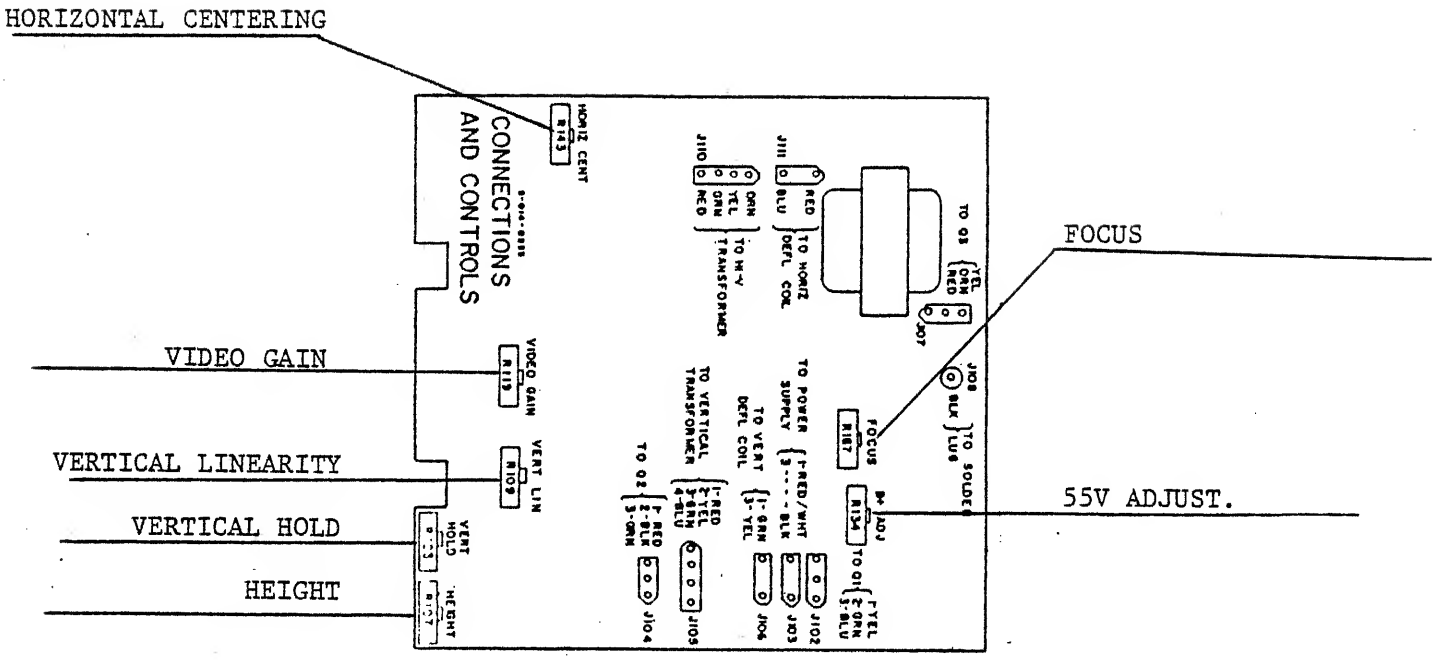
DISPLAY ADJUSTMENTS



DISPLAY ASSEMBLY PCB

AS VIEWED FROM FRONT

OF DISPLAY

SERVICE MANUAL

CRT Data Display
TTL Series

5-017-1017

Oct. 27, 1976

Revision B

BALL BROTHERS RESEARCH CORPORATION

ELECTRONIC DISPLAY DIVISION

P.O. BOX 3376 • ST. PAUL, MINNESOTA 55165 • TELEPHONE: (612) 786-8900 • TWX: 910-563-3552

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Section 1
GENERAL INFORMATION

1.1 MONITOR DESCRIPTION

The TTL series Data Display monitor is a solid-state unit for use in industrial or commercial installations where reliable, high quality video reproduction of white alpha-numeric on a black raster.

The monitor features printed circuit board construction for reliability and uniformity. All circuits of the TTL monitor are transistorized. The synchronization circuits have been custom designed to accept video as well as vertical and horizontal drive signals to enable interfacing of this monitor with industrial or digital TTL sources. This feature simplifies the user's sync processing and mixing and allows the unit to operate without composite sync. The electronic packaging has been miniaturized for compatibility with small volume requirements.

1.2 ELECTRICAL SPECIFICATIONS

Input Data Specifications

	Video	Vertical Drive Signal	Horizontal Drive Signal
Input Connector	(Necessary Accessory-Available) Printed circuit board card edge connector- Viking #2VK10S/1-2 or Amphenol #225-21031-101		
Pulse Rate or Width	Pulse Width: 45 nsec or greater	Pulse Rate: 47 to 63 pulses/ sec	Pulse Rate: 15,000 to 16,500 pulses/sec
Amplitude	Low = Zero $^{+0.4}_{-0.0}$ volts; High = +4 ± 1.5 volts		
Signal Rise & Fall Times (10% to 90% amplitude)	Less than 20 nsec	Less than 100 nsec	Less than 50 nsec
Input Signal Format	See Figure 1		

Data Display Specifications

Input Impedance	Minimum Shunt Resistance	Maximum Shunt Resistance
(a) Video Input:	3.3K ohms	40pF
(b) Vertical Drive Input:	3.3K ohms	40pF
(c) Horizontal Drive Input:	3.3k ohms	40pF

Video Amplifier

(a)	Bandwidth:	15 MHz (-3 dB)
(b)	Rise and Fall Times (10% to 90% amplitude):	Less than 35 nsec. (linear mode)
(c)	Storage Time:	15 nsec, maximum (linear mode)

Retrace and Delay Times

(a)	Vertical:	900 µsec retrace, maximum
(b)	Horizontal:	9 µsec retrace, maximum

Display Specifications

Cathode Ray Tube: (without bonded panel)

Nominal Diagonal Measurement (inches)	Phosphor	*Resolution (TV Lines)	
		Center	Corner
15	P4	1000 at 40 fL	800 at 40 fL
	P39	1000 at 20 fL	800 at 20 fL
*Resolution is measured in accordance with EIA RS-375 except Burst Modulation (or Depth of Modulation) is adjusted for 100 percent.			

Geometric Distortion

Geometric Distortion as measured using an "EIA Linearity Chart" in accordance with EIA RS-375 shall be equal to or less than 1.5 percent of the active raster height.

Power Requirements

Power Specifications:

Input Connector	Receptacle, Molex #03-06-2041 Supplied with Unit Mating Plug, Molex #03-06-1041-Necessary Accessory (Available)
Input Voltage	105V to 130V rms (120V nominal); 50/60hz
Input Power	40W (nominal) for 525/60 models.
Output Voltages	+55 VDC (short circuit protected) +17 kVDC; 6.3V rms

1.3 ENVIRONMENTAL SPECIFICATIONS

Temperature (Chassis or Custom Unit)

Operating Range:	5°C to 55°C Ambient
Storage Range:	-40°C to 65°C

Humidity

5 to 80 percent (Noncondensing)

Altitude

Operating Range:	Up to 10,000 feet

1.4 HUMAN FACTORS SPECIFICATIONS

X-Ray Radiation

These units comply with DHEW title 21, Subchapter J.

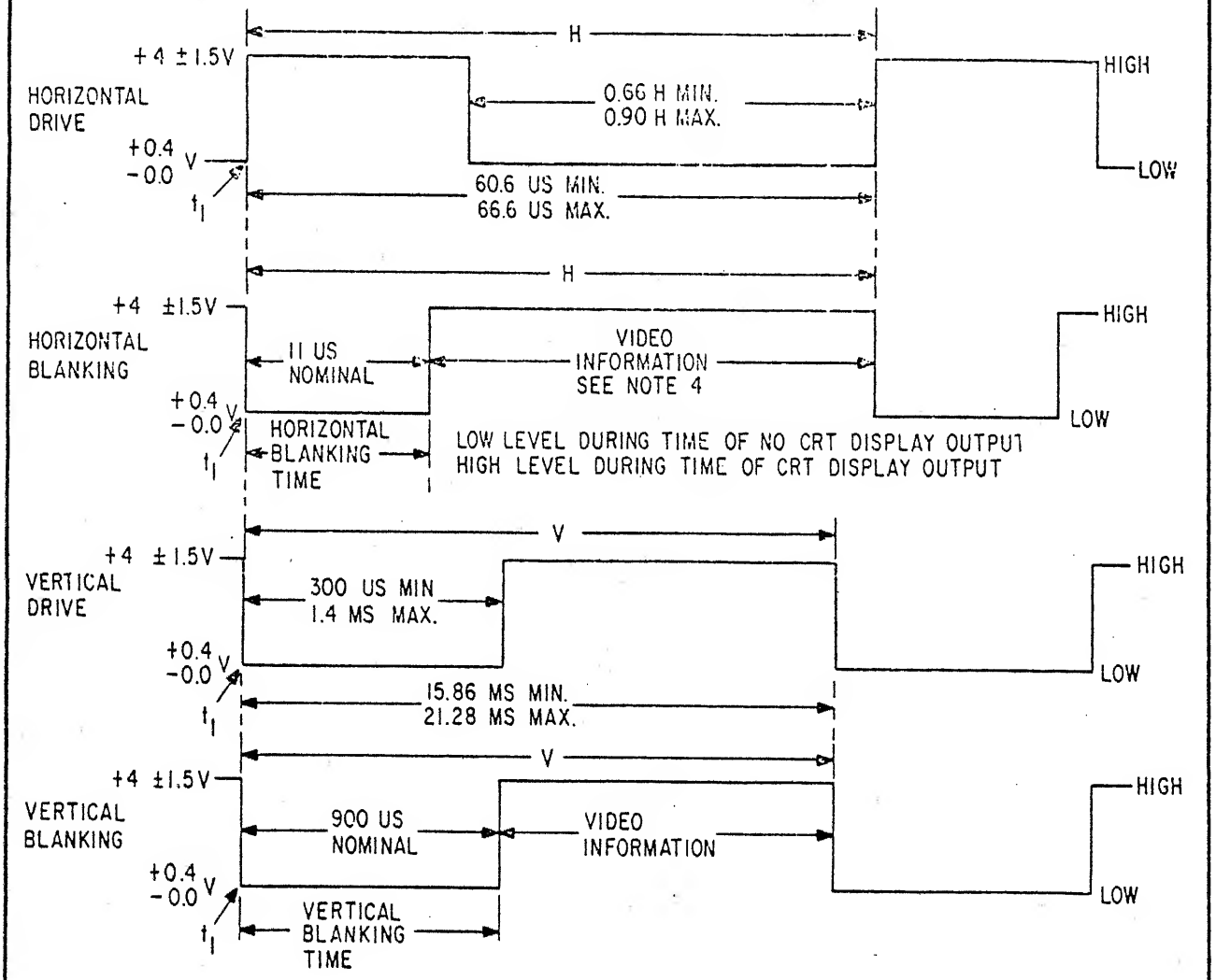
1.5 CONTROLS

Customer Access - Necessary Accessories (Available)

(1) Contrast, 500 ohm potentiometer carbon composition ≥1/8 Watt
(2) Brightness, 100 kilohm potentiometer ≥1/8 Watt
Optional: The Brightness Control can be mounted on the printed circuit board as an internal set up control.

Internal Set Up Controls

(1) Height
(2) Vertical Linearity
(3) Vertical Hold
(4) Focus
(5) Width
(6) Low Voltage Adjust
(7) Horizontal Centering
(8) Video Gain Adjust



NOTES

1. The leading edges of Drive and Blanking waveforms must start at time t_1. Nominal Blanking times should be observed.
2. H = time from start of one line to start of next line.
3. V = time from start of one field to start of next field.
4. Video pulse width should be equal to or greater than 45 nsec.

Fig. 1 Synchronization and Blanking Generator Waveforms for the TTL Series Data Display Series.

Section 2
OPERATING PROCEDURES

2.1 INSTALLATION

Power for the TTL monitor is supplied by a self-contained power supply. 120V AC is applied to the unit via a 4 pin molex connector.

The video and synchronization signals are fed to their appropriate connections as indicated on the schematic.

Mount the monitor so that the air flow around the unit is not blocked and the ambient temperature surrounding it does not exceed 55°C.

2.2 GROUNDING TECHNIQUES

The method of interconnecting and grounding the equipment is a function of the signal frequency; any optimum grounding depends largely on the system in which the equipment is used.

The following grounding technique is recommended when installing a TTL Data Display Monitor.

The vertical/video, horizontal drive, vertical drive, and CRT arc bypass are all returned to the chassis plate ground. Normally, it is assumed that the frame and chassis plate of the monitor will be installed in a system where they will be an integral part of system ground. If this is true, then further grounding should not be necessary. However, the mating of the monitor's frame with the system or the generator's signal source ground must be electrically good. Good electrical metal-to-metal contact must be assured.

Where strong radiated noise and signal fields inhibit the monitor's operation or where a signal's waveform is deteriorated by long or poorly selected cabling, careful attention must be given to proper grounding of the outer conductor. Improper grounding can cause annoying ground loops and in some cases cause transistor failures.

The TTL monitor has provisions at the printed circuit board card edge connector to pick up a ground return for the vertical/video, horizontal drive, and vertical drive circuits if a separate return wire is required.

2.3 VIDEO LEAD ROUTING

The video lead probably will carry frequency signals and should be given the following considerations:

A. To minimize distributed capacity and capacitive pickup of nearby radiated fields, route the video leads separately and away from all other wiring.

B. Make the lead length as short as possible, consistent with the packaging requirements.

C. Ideally, the video line should meet the requirements of a terminated coaxial system; i.e., the video line should exhibit a constant impedance from source to load. An effective method of testing the video line is:

   a. Establish a configuration and keep the foregoing requirements in mind.

   b. Drive the source end of the video line with the output of TTL logic or an equivalent pulse generator capable of providing pulses with rise and fall times of typically 10 nanoseconds and pulse widths of approximately 100 nanoseconds. Any convenient duty cycle and repetition rate may be used. The generator should be capable of supplying +2.5 volt pulse into a shunt impedance of 3.3k ohms (resis tive) and 40 pF (capacitive).

   c. Observe the pulse at the receiving end of the video line with a low capacitance (less than 5 pF) oscilloscope probe. Adjust the routing and termination of the video line to maintain rise and fall times of 20 nanoseconds or less and overshoots within 10 percent of the pulse amplitude.

2.4 INITIAL TURN-ON PROCEDURE

Connect the video and synchronization signals to the monitor. Apply AC power to the monitor. Adjust the brightness and contrast controls for desired effect and stabilize the picture with the vertical and horizontal hold controls.

Section 3
THEORY OF OPERATION

3.1 VIDEO AMPLIFIER

The incoming video signal of 4V P-P (typical) is applied to the monitor via pin 8. The video signal is applied through R115 to the base of Q103. Transistors Q103 and Q104 form the video amplifier stage for the monitor. Refer to figure 3-1 and schematic at rear of manual.

Transistor Q103 and its components comprise the video inverter amplifier with an adjustable gain of 12 to 25. Q103 operates as a class B amplifier. It remains cutoff until a positive going signal arrives at the base and turns Q103 on. R118 and R119 provide series feedback which makes the voltage gain relatively independent of transistor variations and stabilizes it against voltage and current changes caused by ambient temperature variations.

The negative going signal at the collector of Q103 is direct coupled to the base of Q104, an emitter follower output driver that provides a low source impedance for driving the cathode of the CRT. The class B biasing of Q104 allows more than adequate video output signal to modulate the CRT's cathode and results in a maximum available contrast ratio. Typically about 25V P-P video is required for optimum contrast.

The over-all brightness of the CRT is determined by the negative voltage at the grid and is varied by the brightness control. Normal adjustment range of CRT grid voltage is from +10 to -100VDC.

3.2 VERTICAL DEFLECTION AMPLIFIER

Transistor Q101 is a programmable unijunction transistor and with its external circuitry, forms a relaxation oscillator operating at the vertical rate. The sawtooth forming network consists of R106, R107, R108, C103 and C104. These capacitors charge exponentially until the voltage at the anode of Q101 exceeds its gate voltage at which time Q101 becomes essentially a closed switch allowing a rapid discharge through L101. The oscillator is synchronized by a negative pulse applied to its gate from pin 9.

A divider network consisting of R102, R103 and R104 sets the free running frequency by establishing an adjustable reference voltage at the gate. This feature programs the firing of Q101 and amounts to resistive selection of the intrinsic standoff ratio of the unijunction. The frequency is thus controlled by external elements only; it does not depend on this parameter of the unijunction. CR101 and CR102 provide temperature compensation. L101 forms a tuned circuit with C103 and C104 during conduction of Q101 that provides a stable control on the drop out time of Q101.

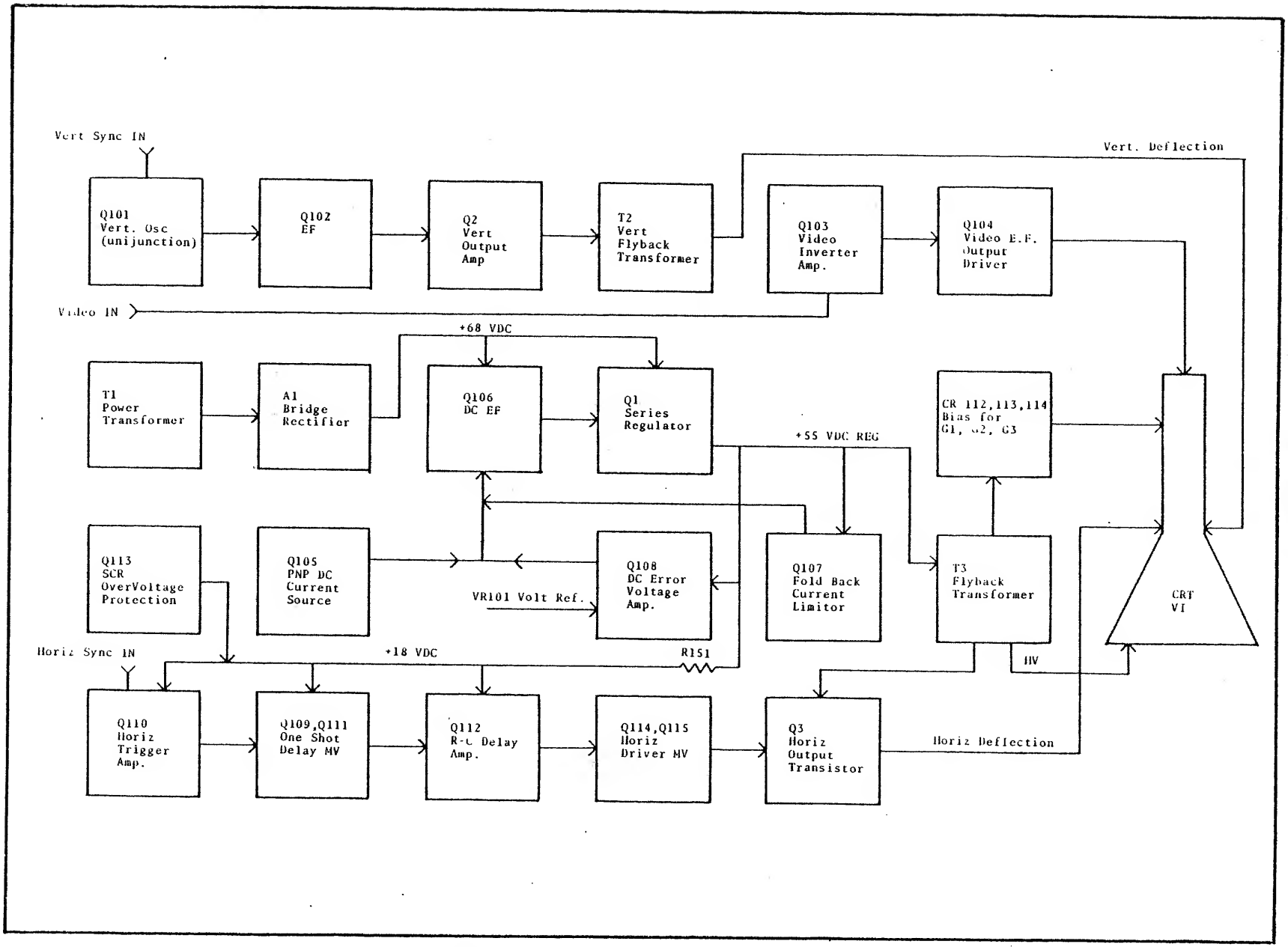


Fig. 3-1 TTL Block Diagram

The sawtooth at the anode of Q101 is directly coupled to the base of Q102. This stage functions as a darlington pair emitter follower driver for the output stage Q2. It presents an extremely high impedance in shunt with R108 and prevents the beta dependent input impedance of Q2 from affecting the frequency of the sawtooth forming network.

Linearity control of the sawtooth is accomplished by coupling the output at Q102 emitter resistively back into the junction of C103 and C104. R110, R109 and C104 integrates the sawtooth and inserts a parabolic component. The slope change rate of the sawtooth at Q102 output is controlled by the setting of R109.

Height control R107 varies the amplitude of the sawtooth voltage developed by controlling the effective B+ applied to R108 and therefore controls the vertical raster size on the CRT.

The vertical output amplifier Q1 uses a power type transistor operating as a class B amplifier. The output is transformer coupled to provide a proper impedance match with the yoke. CR103 , R113 and C107 form a clamp circuit which limits the collector voltage at Q2 to safe levels during retrace. R121 prevents oscillations by providing damping across the vertical deflection coils.

3.3 HORIZONTAL DEFLECTION CIRCUITS

The horizontal sync pulse must be delayed almost a full line to provide the proper timing to drive the horizontal output amplifier. Two circuits are used to create this delay: 1) a one-shot delay multivibrator Q109/Q111 and 2) the R-C delay amplifier Q112. The delayed pulse from Q112 is used to trigger the driver multivibrator (MV) Q114/Q115 at the line rate. This MV does not create any significant delay but does establish the proper time duration of approximately one-half line and the output polarity to drive the horizontal output amplifier.

The horizontal sync input signal is applied to pin 6 of the circuit card. This signal is differentiated and the positive edge of the signal is used to trigger Q110. The negative pulse at the collector of Q110 will trigger the one-shot Q109/Q111. After one half line the MV recovers and returns to its original state. The Q109 output signal is applied to Q112 through C117. This causes Q112 to generate a 15 Volt pulse at its collector. After one-third line duration,capacitor C117 discharges through CR108, R144 and R143 and terminates the output signal at Q112. The trailing edge of Q112 output signal is differentiated by C121 and is used to trigger Q114/Q115.

Q114 and Q115 are used as a one-shot driver MV. The normal state of the MV is with Q114 at saturation and Q115 at cut off. A negative going differentiated pulse from Q112 is applied to Q114. This drives Q114 to cut off, and Q115 into saturation. Q114 is held at cutoff by the feedback circuit consisting of R157, R156, C122 and CR109. After approximately one-half line duration, capacitor C122

discharges through R152 and drives Q114 into saturation. Q115 is driven to cutoff and results in a 100 Volt pulse at its collector with an additional 100V transient at the leading edge. This signal is clipped and limited to approximately 55V by R157 and CR110. It is further attenuated to 25V amplitude by resistor divider network R156 and R155. Q115 output signal is also coupled through C122 to initiate regeneration and hold Q114 in conduction until the next trigger pulse arrives.

During conduction of the driver transistor Q115 energy is stored in the coupling transformer. The voltage at the secondary is also negative so that Q3 is held at cut off. When the primary current of T101 is interrrupted due to collector cutoff of Q115 the secondary voltage reverses polarity. Q3 goes into conduction due to the positive signal at its base. The collector current of Q3 will slowly increase in a sawtooth pattern during the remaining period of the TV line scan. Typically the peak sawtooth current through Q3 will be two to three amps depending upon line rate and length of TV line scan.

The horizontal output stage has three main functions: to supply the yoke with the correct horizontal scanning currents; develop 17kV for the CRT anode and to develop +800V and -100V for the CRT supply voltages.

Horizontal output transistor Q3 acts as a switch which is turned on and off by the rectangular waveform on the base. When Q3 is turned on, the supply voltage plus the charge on the C135 causes yoke current to increase in a linear manner and moves the beam from near the center of the screen to the right side. At this instant, the transistor is turned off by a negative voltage on its base which causes the output circuit to complete one half cycle of sine wave oscillation. A positive flyback voltage pulse of several microseconds duration and several hundred volts amplitude in the form of a half cycle sine wave pulse is developed by the combined inductance of the yoke, T3 and C127. The peak magnetic energy which was stored in the yoke during scan time is then transferred to C127 and the yoke's distributed capacity. During this cycle, the beam is returned to the center of the screen.

C127 and the distributed capacity now discharge into the yoke and induce a current in a direction opposite to the current of the previous part of the cycle. The magnetic field thus created around the yoke moves the beam to the left of the screen.

After one half cycle, the voltage across C127 swings below ground potential and biases the damper diode CR116 into conduction and prevents the flyback pulse from oscillating. The magnetic energy that was stored in the yoke from the discharge of the distributed capacity and C127 is released to provide sweep for the first half of the scan and to charge C135 through the rectifying action of the damper diode. The beam is then at the center of the screen. The cycle will recur when the base voltage of Q3 is driven positive again.

C135 also serves to block DC currents through the yoke and provide "S" shaping of the current waveform. "S" shaping compensates for stretching at the left and right sides of the CRT. The width sleeve inserted between the yoke and CRT also provides partial linearity correction at the beginning of the horizontal scan.

L104 is an adjustable width control placed in series with the horizontal deflection coils. This variable inductor allows a greater or lesser amount of the deflection current to flow through the horizontal yoke and varies the width of the horizontal scan.

The positive flyback pulse developed during the horizontal retrace time is rectified by CR114 and filtered by C125. This produces approximately 600 volts and is coupled through the focus control R167 to G3 of the CRT. CR112, CR113, C123 and C124 comprise a voltage doubler which delivers approximately 1000 volts to a divider network of R163 and R170. This divider provides approximately 800 volts for G2 of the CRT. This same pulse is transformer-coupled to the secondary of transformer T2 where it is rectified by CR1 and CR115 to produce rectified voltages of approximately 17kV and -100 volts. The 17kV is the anode voltage for the CRT. The -100 volts serves as the source voltage for the brightness control R165 or an external brightness control.

The collector voltage for Q109, Q110, Q111 and Q112 is obtained by dropping the +55 volt supply down to approximately +20 volts by the use of the series dropping resistor R151. The use of a separate lower supply bus provides a means of automatic shut down in the event of an over voltage condition which might generate X-rays and protection of random drive pulses to the horizontal output transistor during "turn on" or "turn off" of the monitor.

Protection against X-rays due to over voltage operation of the line or DC regulator circuits is provided by Q113, VR102 and associated components. In the event the +55 VDC regulator circuit should fail and the output voltage exceed approximately 60 volts, the voltage developed by resistor divider network R147, R148 and R149 will increase also. This increased voltage will cause current conduction through VR102 and R150. The voltage developed across R150 will cause Q113 to fire so that the heavy current will flow from anode to cathode to discharge capacitor C118 and drop the entire supply voltage across R151. This will disable the low level MV's and consequently disable the horizontal output stage and the associated high voltage supply.

This separate supply bus also provides protection against random drive pulses to the horizontal output transistor during "turn on" or "turn off". Normally several AC cycles are required after "turn on" to bring the +55 VDC bus up to normal. By virtue of the component values selected for Q109, Q111 and series dropping resistor R151, Q109 and Q111 would not trigger until the regulator voltage exceeds approximately +30 volts. This DC supply is adequate to provide stable operation of the horizontal circuit and base drive to the horizontal output amplifier so that random drive pulses and poor

collector saturation of Q3 are avoided.

During "turn off" this separate supply bus also offers some degree of protection against CRT spot burn. After AC power is turned off power supply filter capacitor C3 is rapidly discharged by the load current so that the +55 VDC regulator output decays rapidly to 30 volts. Below this level Q109 and Q111 will fail to trigger. As a result the horizontal output transistor and associated HV circuitry are disabled. This will result in a reduction of discharge current from the power supply filter C3 to approximately one third its former rate.

The energy retained by C3 will also be used mainly by the vertical deflection circuit for a significently longer period of operation. The energy of the CRT beam will then be distributed along the vertical axis of the CRT to prevent spot burn while the HV stored in the CRT aquadag is discharged.

3.4 LOW VOLTAGE REGULATED SUPPLY

The AC line voltage is applied through a molex connector to the primary windings of transformer T1 which is located on the power supply module.

The secondary windings illustrated at the bottom of T1 is used to supply 6.3 VAC filament voltage. The other winding is used to apply an AC voltage to A1 so that approximately +68 volts is developed across C3.

The +68 volts is dropped to +55 volts by the series regulator Q1. DC regulation of +55 volts is maintained by tapping down the voltage through divider network R133, R134, and R135. Approximately +7 volts at the center tap of R134 is applied to the base of Q108. Also a DC reference voltage from VR101 is applied to the emitter of Q108. This transistor then developes a DC error current which flows through R130 to the base of emitter follower Q106. A DC bias current is supplied to the base of Q106 and the collector of Q108 by Q105 which is used as a DC current generator. The bias current from Q105 will tend to shift the base of Q106 in a positive direction whereas the current from Q108 will tend to shift the base in the negative direction. This results in an error current from the collector of Q108 that controls emitter follower Q106 and also the series pass transistor Q1. The result is that the DC output voltage is maintained at +55 VDC with various load currents and variations of the input AC voltage.

Fold-back current limiting of the +55 VDC supply is provided by means of transistor Q107, resistor R127, R128 and R129. The DC bias current flowing down through R127 and R129 to ground provides a DC drop of approximately 2.4 volts across R127. The DC load current flowing through R128 will provide a voltage drop across this resistor so that the drop is proportional to the load current. If this load current exceeds 2.4A, the emitter of Q107 will be biased approximately 3 volts below the emitter of Q1, assuming that voltage drop of 2.4V across R128 and .6 volts across CR106. In as much

the base of Q107 is biased at 2.4 volts below the emitter of Q1, Q107 will conduct so that the voltage drop across Q105 is increased and the DC output voltage of the supply will decrease below +55 volts. This will limit peak current to approximately 2.4 amperes. In the event of a direct short on the +55 VDC bus, the output voltage will drop to approximately zero and the short-circuit current will be limited to approximately 100MA. Clearing or removing the external short-circuit will allow the regulator to resume normal circuit operation. The average current through Q1 is approximately one half ampere, however the combined peak currents of the horizontal and vertical deflection circuits may be much greater than this even though electrolytic capacitors are used across the +55 volt bus.

Section 4

PRELIMINARY ADJUSTMENTS

4.1 SYNCHRONIZATION AND DRIVE SIGNALS

Apply horizontal and vertical drive signals to the horizontal and vertical drive terminals as indicated on the schematic. Adjust the levels to a nominal 4 volt peak-to-peak.

The horizontal drive signal is required to initiate horizontal scan and high voltage, and should be connected before applying power to the monitor.

4.2 LOW VOLTAGE SUPPLY

Connect a voltmeter between ground and junction of R131 and CR106 cathode. Adjust the B+ voltage control R134 for a reading of 55V.

4.3 BRIGHTNESS

Normally, the monitor will be used to display alphanumeric or other black and white information. Normally the video polarity is usually white characters on a black background.

The brightness control should be adjusted to a point where the white raster is just extinguished. The CRT will then be at its cutoff point, and a maximum contrast ratio can be obtained when a video signal is applied.

4.4 VIDEO CONTRAST

Q103 is designed to operate linearly when a +2.5V signal is applied to its base. An external contrast control (500Ω) is used to maintain this level. This control should be adjusted for a typical signal level of +2.5V peak-to-peak when measured at the video input terminal of the board edge connector. The video gain control R119 should be adjusted for optimum contrast or detail while observing the CRT.

4.5 VERTICAL ADJUSTMENTS

There is a slight interaction among the vertical frequency, height, and linearity controls. A change in the height of the picture may affect linearity. Consequently the adjustment should be carried out in the following sequence:

(1) Apply video and synchronization signals to the monitor.

(2) Set the vertical hold control, R103, near the mechanical center of its rotation.

(3) Adjust the vertical height control R107 for desired height.

(4) Adjust the vertical linearity control R109 for best vertical linearity.

(5) Remove the vertical drive signal from the unit or use a short jumper lead and short the vertical drive input terminal of the board edge connector to ground.

(6) Readjust the vertical hold control R103 until the picture rolls down slowly.

(7) Restore vertical drive to the monitor and check height and linearity.

4.6 HORIZONTAL ADJUSTMENTS

Raster width is affected by a combination of the low voltage supply, width coil L104, and the width sleeve located on the neck of the CRT beneath the yoke.

(1) Apply video and sync signals to the monitor.

(2) Adjust the horizontal width coil L104 for the desired width.

(3) Insert the width sleeve farther under the yoke to obtain the best linearity. Although this adjustment will affect the raster width, it should not be used solely for that purpose. It should be inserted only as far as required for adequate linearity correction, otherwise excessive current will be drawn by the horizontal output amplifier.

(4) Readjust L104 for proper width.

(5) Observe final horizontal linearity and width, and touch up either adjustment if needed.

No horizontal hold control is used in this monitor. The raster should be properly locked and can be centered with the video centering control R143.

4.7 FOCUS ADJUSTMENT

The focus control, R165, provides an ajustment for maintaining best over-all display focus.

4.8 CENTERING

If the raster is not properly centered, it may be repositioned by rotating the ring magnets behind the deflection yoke. The magnets should not be used to offset the raster from its nominal center position because it would degrade the resolution of the display. If the picture is tilted, rotate the entire yoke.

Section 5

TROUBLE SHOOTING AND MAINTENANCE

5.1 ISOLATION OF CIRCUIT FAULTS

In the event of failure or malfunction of the monitor there is a sequence of simple steps which can be carried out to isolate the fault to a particular circuit area. The first thing to check is the +55 VDC bus. In the event of a short circuit the voltage regulator will "foldback" to limit the current. In the event of a direct short the DC voltage will decay to zero. In other situations excessive load current will cause the regulator to "fold back" and then "start up" again. This cycle may reoccur at a relatively high rate such as a thousand times per second which is probably due to attempting to energize a faulty horizontal output stage. A low audible buzz may often be heard. This "fold back" and "restart" of the regulator may also occur at a much lower rate such that it appears to be synchronized with the vertical rate. This probably would be due to excessive pulse current drawn by the vertical output deflection amplifier. Isolation of faulty circuit blocks may be done as follows:

(1) Disconnect Molex connector to J104 to isolate the vertical output stage.

(2) Disconnect Molex connector to J110 to isolate the flyback transformer and horizontal output transistor stage.

NOTE: Removal of connector at J110 will open circuit the "ground" wire conductor to chassis. Use short "alligator clip lead" between chassis and case of aluminum filter capacitor C3 in power supply module to reestablish ground connection.

Removal of the above two circuit blocks should reduce load current on the +55 VDC regulator to a fraction of the former value. Failure of the regulator to perform normally should probably be attributed to a shorted electrolytic capacitor on the board or defective components in the regulator circuit.

Actual isolation of a fault to a single transistor stage is best accomplished by use of a scope and reference to typical waveforms contained in this section. The most critical tests or waveforms of the horizontal output stages are:

(1) Driver transformer (T101) primary waveform
(2) Horizontal flyback pulse at Q3-C
(3) Radiated pulse from flyback transformer T3 (Hold a 10:1 scope probe approximately 2" away from the HV flyback transformer).
(4) Check parabolic waveform voltage across "s" shaping capacitor C135.
(5) Measure DC current to horizontal output amplifier by measuring voltage drop across R168. Typical current of .25 A DC should generate a voltage drop of .3 volt DC. Current on high line rate models should run somewhat higher.

(6) "Tearing" of raster may be due to "over Voltage" adjustment of the +55 VDC regulator. This may cause erratic "firing" of the SCR transistor Q113. Absence of drive signals to horizontal output stage may be due to complete shut down of SCR Q113.

Tests on the power transistor circuits located on the PC board can be carried out by the use of scope and reference to typical voltage waveforms.

Typical waveforms are illustrated by section 5.2. Waveforms of high line rate models are similar with the time duration of the waveforms will be somewhat less, i.e. they should be scaled in time such that they are proportional to the time of a horizontal line. The amplitude of the horizontal flyback pulse should be somewhat less due to lower values of yoke inductances. Waveforms which occur at field rate should be similar. Figure 5-1 illustrates the component location and the location of the molex connectors and wire color codes.

Waveforms which occur at field rate were taken with the scope externally synchronized to the leading edge of vertical drive. In the case of waveforms at horizontal line rate the scope was synchronized to the leading edge of horizontal drive, consequently the time relationship of each waveform actually indicates the relative time delay of each multivibrator. In most cases, the scope was DC coupled when the waveforms were taken so that the relative position of ground potential on the waveforms could be indicated.

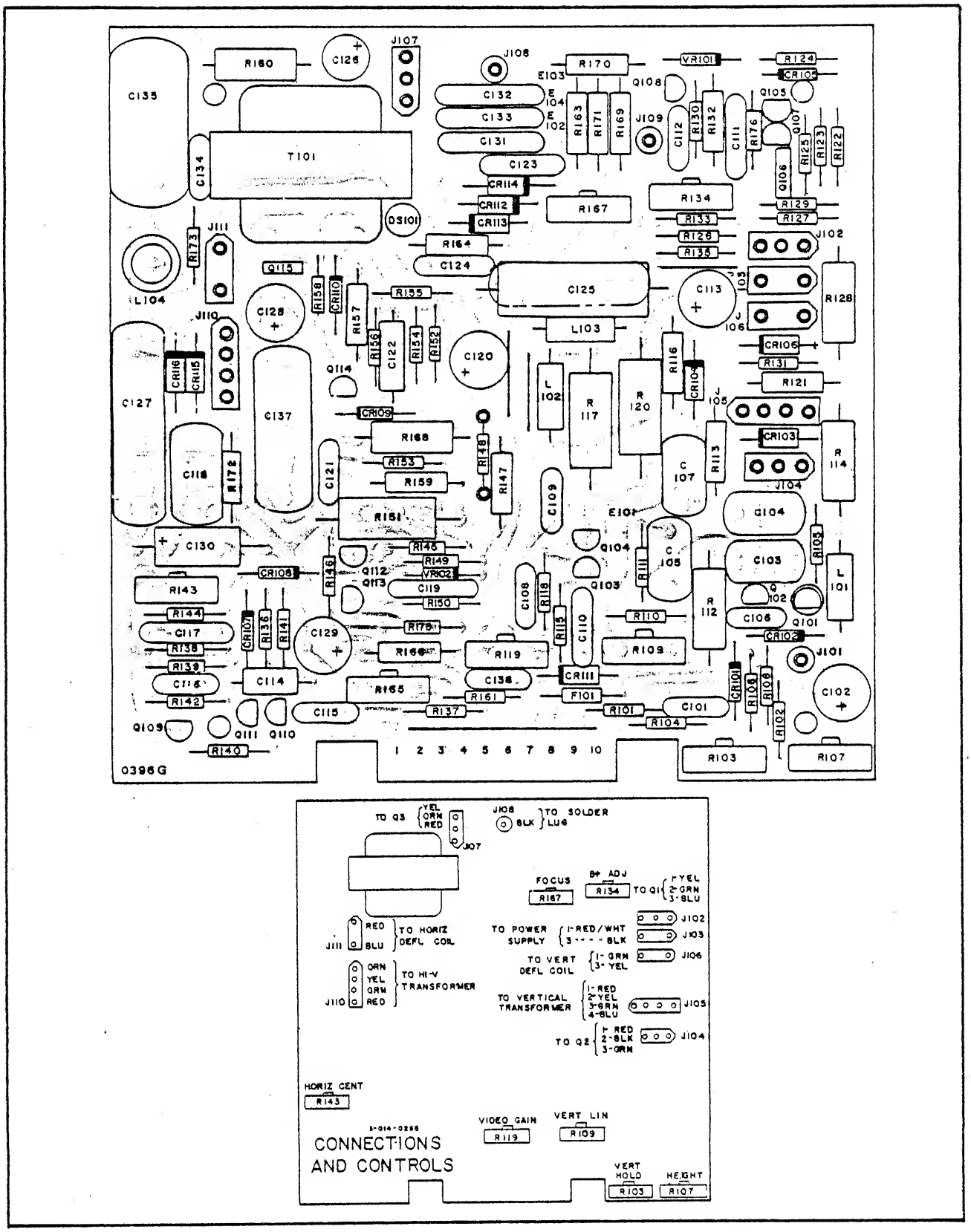
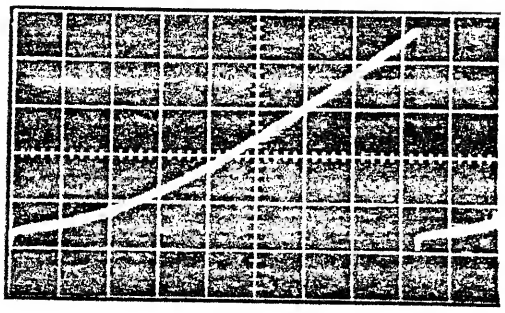


Fig. 5-1 Circuit Board Component Location and Intercabling Diagram.

5.2 TYPICAL WAVEFORMS AND VOLTAGES

Q101-anode
Field Rate
1V/Div

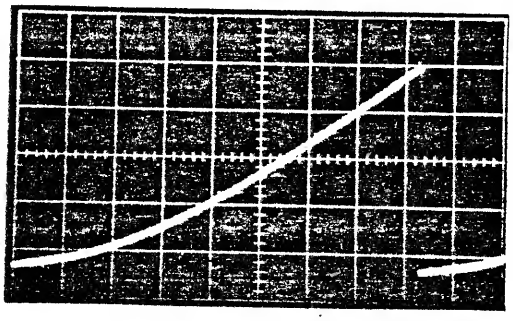
Ground Ref. →



#1

Q2-Base
Field Rate
1V/Div

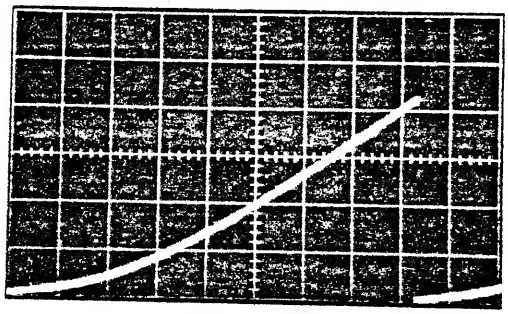
Ground Ref. →



#2

Q2-Emitter
Field Rate
1V/Div

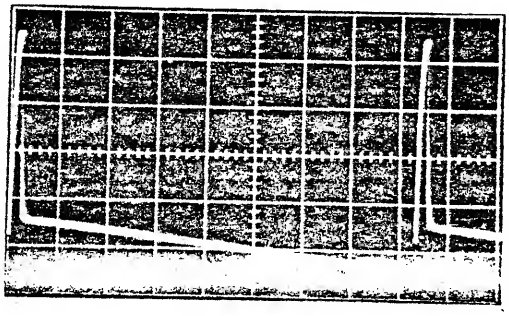
Ground Ref. →



#3

Q2-Collector
Field Rate
50V/Div

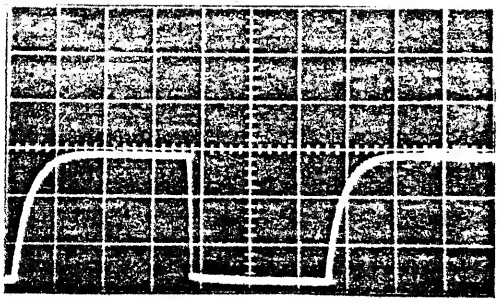
Ground Ref. →



#4

Q109-Collector
Line Rate
5V/Div

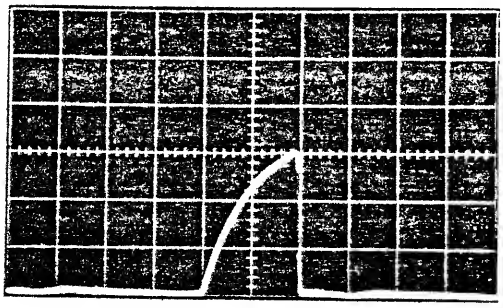
Ground Ref. ⟶



#5

Q112-Collector
Line Rate
5V/Div

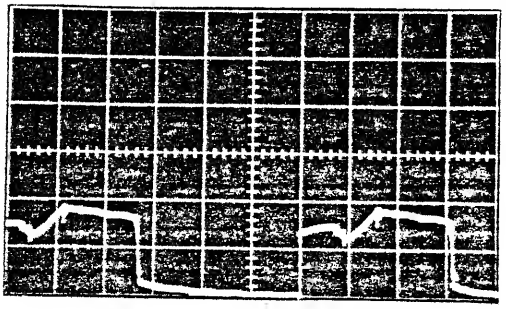
Ground Ref. ⟶



#6

Q114-Collector
Line Rate
.5 Volt/Div

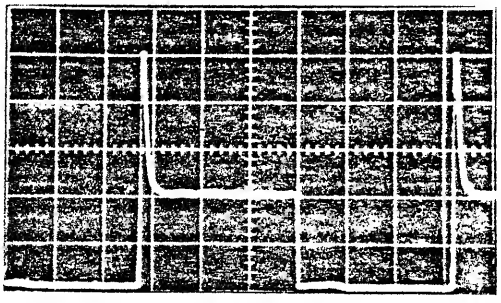
Ground Ref. ⟶



#7

Q115-Collector
Line Rate
50V/Div

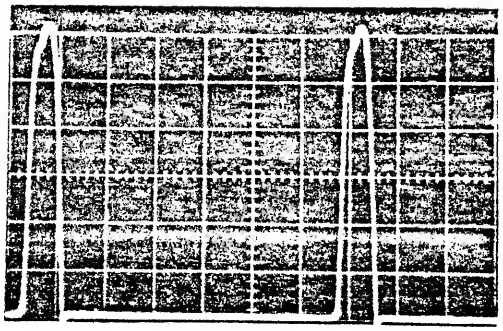
Ground Ref. ⟶



#8

Q3-Collector
(Horiz. Flyback Pulse)
Line Rate
100V/Div

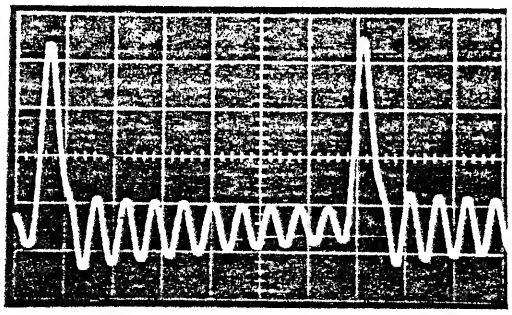
Ground Ref. ⟶



#9

Radiated Pulse from
flyback Transformer. 10:1
Probe held 2" away
Line Rate
50V/Div

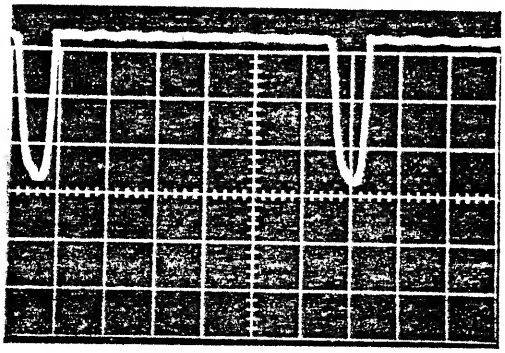
Scope AC
Coupled



#10

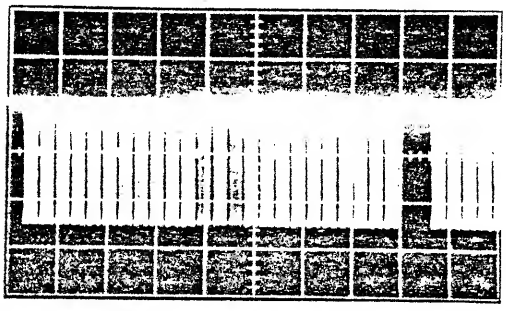
Ground Ref. ⟶

CR115 Cathode
Line Rate
50V/Div



#11

CRT Cathode
Line Rate
10V/Div



#12

Ground Ref. ⟶

Section 6

TTL Parts List

SYMBOL		DESCRIPTION	BBRC PART NUMBER
A1		Bridge Rectifer, VS148	1-021-0413
		CAPACITOR, fixed; uF unless otherwise stated	
C1		.001 ± 10%; 1000V, ceramic disc	1-012-0540
C2		.01; 1000V, arc gap ceramic	1-021-0112
C3		1400; 90V, electrolytic	1-012-2186
C101		.001 ± 10%; 1000V, ceramic disc	1-012-0540
C102		50; 50V, electrolytic	1-012-2157
C103		.22 ± 10%; 200V, mylar	1-012-0930
C104		.22 ± 10%; 200V, mylar	1-012-0930
C105		.22 ± 10%; 200V, mylar (TTL15/AM, TTL15/C, TTL15/875, TTL15/1029)	1-012-0930
C106		.001 ± 10%; 1000V, ceramic disc (TTL15/AM, TTL15/C, TTL15/875, TTL15/1029).	1-012-0540
C107		.1 ± 10%; 400V, mylar	1-012-2239
C108		250pF ± 5%; 500V, dipped mica	10-57-5251
	or	180pF ± 5%; 500V, dipped mica (TTL15/C, TTL15/875, TTL15/1029)	10-57-5181
C109		100pF ± 5%; 500V, dipped mica	1-012-0300
C110		.1 ± 20%; 100V, ceramic disc	10-12-7104
C111		.1 ± 20%; 100V, ceramic disc	10-12-7104
C112		27pF ± 5%; dipped mica	1-012-2161
C113		5; 150V, electrolytic	1-012-2195
C114		.0039 ± 10%; 200V, mylar	10-47-7392
	or	.0033 ± 10%; 200V, mylar (TTL15/AV)	10-47-7332
	or	.0022 ± 10%; 200V, mylar (TTL15/C, TTL15/875)	10-47-7222
	or	.0018 ± 10%; 200V, mylar (TTL15/AM)	10-47-7182
	or	.0015 ± 10%; 200V, mylar (TTL15/1029)	10-47-7152
C115		.001 ± 10%; 1000V, ceramic disc	1-012-0540
C116		22pF ± 5%; 500V, dipped mica	10-57-5220
C117		750pF ± 5%; 100V, dipped mica	10-57-5751
C118		.47 ± 10%; 200V, mylar	1-012-1927
C119		.1 ± 20%; 100V, ceramic disc	10-12-7104
C120		5; 150V, electrolytic	1-012-2195
C121		.001 ± 10%; 1000V, ceramic disc	1-012-0540
	or	.002 ± 10%; 500V, ceramic disc (TTL15/AM)	10-16-7208
C122		.0082 ± 10%; 200V, mylar	10-47-7822
	or	.0022 ± 10%; 200V, mylar (TTL15/AM, TTL15/C, TTL15/1029, TTL15/875)	10-47-7222
C123		.01 ± 20%; 1000V, ceramic disc	1-012-2214
C124		.02 ± 20%; 1000V, ceramic disc	1-012-2217
C125		.015 ± 10%; 1000V, film/paper	1-012-2201
	or	.1 ± 10%; 600V, mylar (TTL15/1029)	1-012-2202
C126		25; 25V, electrolytic	1-012-2212
	or	10; 25V, electrolytic (TTL15/AM, TTL15/C, TTL15/1029, TTL15/875)	1-012-2211

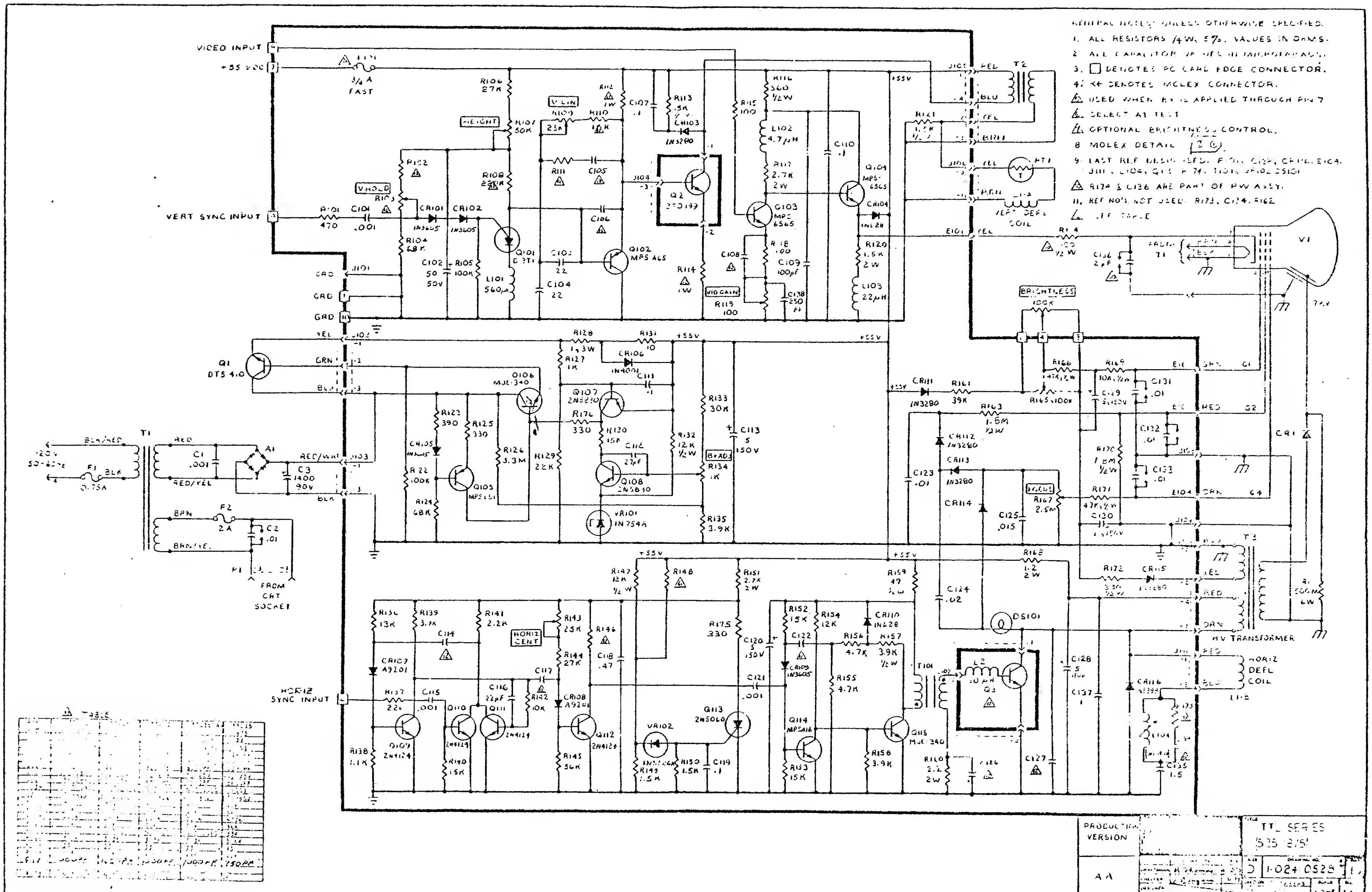
SYMBOL		DESCRIPTION	BBRC PART NUMBER
C127		.0056 ± 10%; 2000V, mylar	10-35-7562
	or	.005 ± 10%; 1600V, mylar (TTL15/0)	1-012-2232
	or	.0068 ± 10%; 1600V, mylar (TTL12)	1-012-2210
C128		5; 150V, electrolytic	1-012-2195
C129		5; 150V, electrolytic	1-012-2195
C130		1; 150V, electrolytic	1-012-2168
C131		.01; 1000V, arc cap, ceramic	1-012-0112
C132		.01; 1000V, arc cap, ceramic	1-012-0112
C133		.01; 1000V, arc cap, ceramic	1-012-0112
C134		.001 ± 10%; 1000V, ceramic disc	1-012-0540
C135		1.5 ± 10%; 100V, polycarbonate	1-012-2216
C136		2pF; 250V, arc cap	1-012-0111
C137		1 ± 10%; 100V, mylar	1-012-1025
C138		250pF ± 5%; 500V, dipped mica	10-57-5251
		DIODE	
CR101		1N3605	1-021-0410
CR102		1N3605	1-021-0410
CR103		1N3280	1-021-0403
CR104		1N628	1-021-0160
CR105		1N3605	1-021-0410
CR106		1N4001	78-62-4001
CR107		1N3605	1-021-0410
CR108		1N3605	1-021-0410
CR109		1N3605	1-021-0410
CR110		1N628	1-021-0160
CR111		1N3280	1-021-0403
CR112		1N3280	1-021-0403
CR113		1N3280	1-021-0403
CR114		VG-1X	1-021-0447
CR115		1N3280	1-021-0403
CR116		1N5398	1-021-0436
CR1		RHC-25-20	1-021-0438
DS101		NO. 1764	1-026-0308
		FUSE	
F1		3/4A-125	1-028-0242
	or	1A-125	28-13-0100
F2		2A-125V	1-028-0249
		COIL	
L1		Deflection coil assembly	6-004-0323
	or	Deflection coil assembly (TTL15/0)	6-004-0676
	or	Deflection coil assembly (TTL12)	6-004-0350
	or	Deflection coil assembly (TTL15C)	6-004-0347
	or	Deflection coil assembly (TTL15/1029)	6-004-0328
	or	Deflection coil assembly (TTL15/875)	6-004-0336
	or	Deflection coil assembly (TTL15/AM)	6-004-0354

SYMBOL		DESCRIPTION	BBRC PART NUMBER
L2		10µH	15-13-1100
L101		560uH	1-016-0302
L102		4.7µH	15-13-1479
L103		22uH	15-13-1220
L104		Width Coil	1-016-0304
	or	Width coil (TTL15/0)	1-016-0309
	or	Width coil (TTL15/AM, TTL15/C, TTL15/1029, TTL15.875)	1-016-0299
		TRANSISTOR	
Q1		DTS-410	78-85-0410
Q2		2SD-199	1-015-1176
Q3		DTS-402 (525)	78-85-0402
	or	DTS-802 (TTL15/875)	1-015-1189
	or	A705 (TTL15/0)	78-85-0709
Q4		A705	78-85-0709
Q101		2N6027	1-015-1157
Q102		MPS-A65	1-015-1186
Q103		MPS-6565	1-015-1185
Q104		MPS-6565	1-015-1185
Q105		MPS-L51	1-015-1175
Q106		MJE-340	78-86-0340
Q107		2N5830	1-015-1172
Q108		2N5830	1-015-1172
Q109		2N4124	1-015-1139
Q110		2N4124	1-015-1139
Q111		2N4124	1-015-1139
Q112		2N4124	1-015-1139
Q113		2N5060	1-015-1168
Q114		MPS-A16	1-015-1193
Q115		MJE-340	78-86-0340
		RESISTOR fixed film: ¼W ± 5% unless otherwise stated	
R1		500M; 6W, deposited carbon (AA version)	1-011-1800
	or	500M; 6W, deposited carbon (BB version)	1-011-2456
R2		1Ω ± 10%; 3W, wirewound	1-011-1742
R3		1Ω ± 10%; 3W, wirewound	1-011-1742
R101		470Ω	70-16-0471
R102		470Ω	70-16-0471
	or	10K (TTL15/AM, TTL15/C, TTL15/1029, TTL15/875)	70-16-0103
R103		Var; 10K ± 20%; 1/8W, composition, vertical hold	1-011-5312
	or	Var; 5K ± 20%; 1/8W, composition, vertical hold (TTL15/1029, TTL15/AM, TTL15/C, TTL15/875)	1-011-5637
R104		6.8K	70-16-0682
R105		100K	70-16-0104
R106		27K	70-16-0273
R107		Var; 50K ± 20%; 1/8W, composition, vertical height	1-011-5375
R108		220K	70-16-0224
	or	470K (TTL15/AM, TTL15/C, TTL15/875, TTL15/1029)	70-16-0474

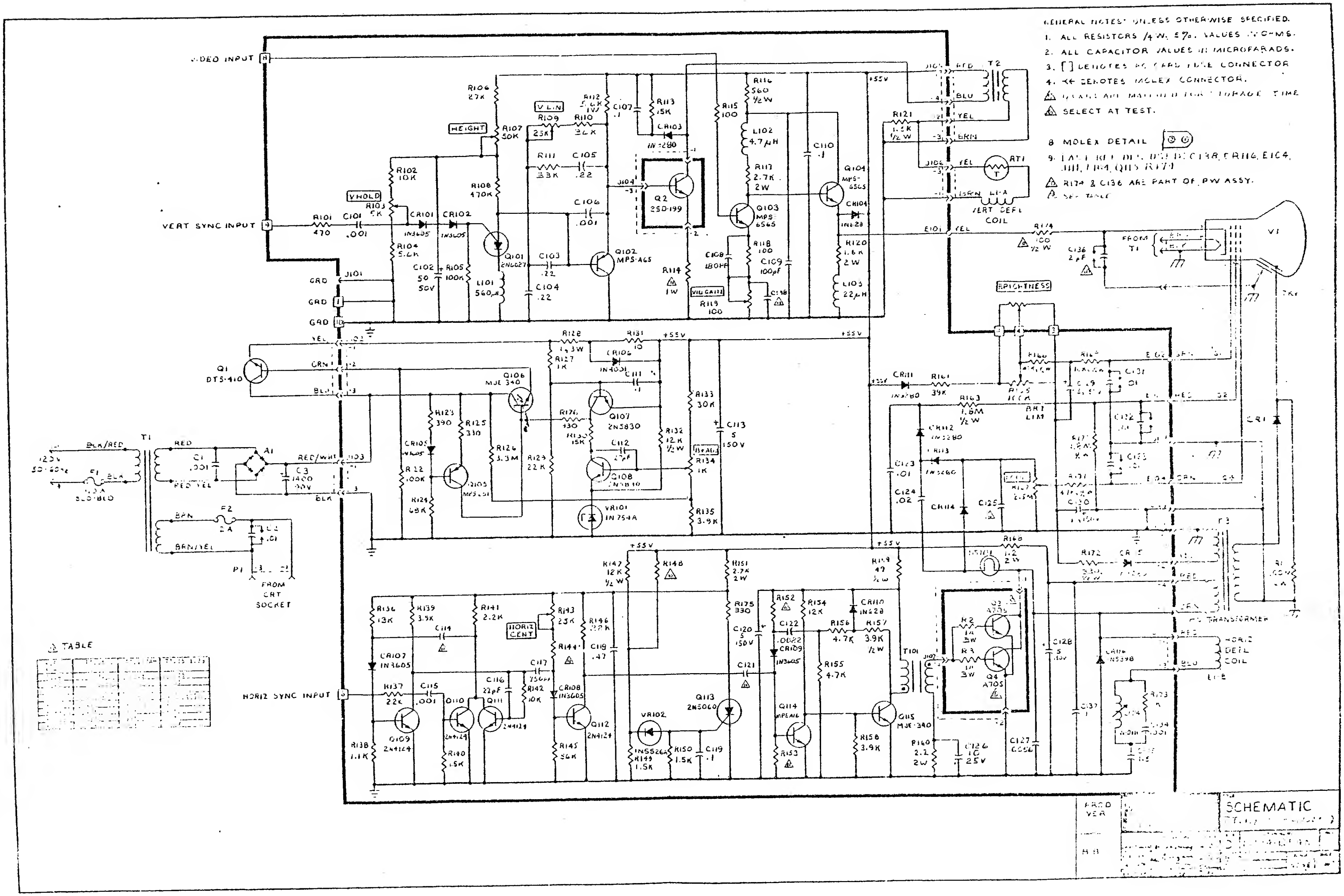
SYMBOL		DESCRIPTION	BBRC PART NUMBER
R109		Var; 25K ± 20%; 1/8W, composition, vertical lin.	1-011-5325
R110		10K	70-16-0103
	or	36K (TTL15-AM, TTL15/C, TTL15/875, TTL15/1029)	70-16-0363
R111		33K (TTL15/AM, TTL15/C, TTL15/875, TTL15/1029)	70-16-0333
R112		3.3K; 1W, composition	1-011-2425
	or	5.6K; 1W, composition (TTL15/AM, TTL15/C, TTL15/875, TTL15/1029)	1-011-2444
R113		15K	70-16-0153
R114		33Ω; 1W, composition	1-011-2426
	or	22Ω; 1W, composition (TTL15/AM, TTL15/C)	1-011-2421
	or	15Ω; 1W, composition (TTL15/875, TTL15/1029)	78-15-0150
R115		100Ω	70-16-0101
R116		560Ω; ½W	1-011-2264
R117		2.7K; 2W, composition	1-011-2420
R118		100Ω	70-16-0101
R119		Var; 100Ω ± 20%; 1.8W, composition, video gain	1-011-5095
R120		1.5K; 2W, composition	1-011-1500
R121		1.5K; ½W	1-011-2274
R122		100K	70-16-0104
R123		390Ω	70-16-0391
R124		68K	70-16-0683
R125		330Ω	70-16-0331
R126		3.3M	70-16-0335
R127		1K	70-16-0102
R128		1Ω ± 10%; 3W, wirewound	1-011-1742
R129		22K	70-16-0223
R130		15K	70-16-0153
R131		10Ω	70-16-0100
R132		12K; ½W	1-011-2296
R133		30K	70-16-2296
R134		Var; 1K ± 20%; 1/8Wc compsition, B+ adjust	1-011-5182
R135		3.9K	70-16-0392
R136		13K	70-16-0133
R137		2.2K	70-16-0222
R138		1.1K	70-16-0112
R139		3.9K	70-16-0392
R140		1.5K	70-16-0152
R141		2.2K	70-16-0222
R142		10K	70-16-0103
R143		Var; 25K ± 20%; 1/8W, composition, horizontal centering	1-011-5325
R144		27K	70-16-0273
	or	22K (TTL15/1029, TTL15/875)	70-16-0223
R145		56K	70-16-0563
R146		22K	70-16-0223
R147		12K; ½W	1-011-2296
R148		Selected	
R149		1.5K	70-16-0152

SYMBOL		DESCRIPTION	BBRC PART NUMBER
R150		1.5K	70-16-0152
R151		2.7K; 2W, composition	1-011-2420
R152		15K	70-16-0153
	or	22K (TTL15C, TTL15/AM, TTL15/875)	70-16-0223
	or	20K (TTL15.1029)	70-16-0203
R153		15K	70-16-0153
	or	8.2K (TTL15/1029)	70-16-0822
R154		12K	70-16-0123
R155		4.7K	70-16-0472
R156		4.7K	70-16-0472
R157		3.9K; ½W	1-011-2284
R158		3.9K	70-16-0392
R159		47Ω; ½W	1-011-2238
R160		2.2Ω; 2W, wirewound	1-011-0120
R161		39K	70-16-0393
R162		Not used	
R163		1.8M; ½W	1-011-2348
R164		100Ω; ½W (used model without DS201)	1-011-2246
R165		Var; 100K ± 20%; 1/8W, composition brightness (optional)	1-011-5435
R166		47K; ½W	1-011-2310
R167		Var; 2.5M ± 20%; 1/8W, composition focus	1-011-5566
R168		1.2Ω; 2W, wirewound	1-011-1395
R169		10K; ½W	1-011-2294
R170		1.8M; ½W	1-011-2348
R171		47K; ½W	1-011-2310
R172		330, ½W	1-011-2258
R173		1K (875)	70-16-0102
R174		100Ω; ½W	1-011-2246
R175		330Ω	70-16-0331
R176		330Ω	70-16-0331
RT1		Thermistor, 2.5Ω @ 25°C (part of L1)	1-011-7008
		TRANSFORMER	
T1		Power	1-017-5400
	or	Power (TTL15/AM, TTL15/C, TTL15/1029, TTL15/875)	1-017-5391
T2		Vertical output	6-003-0341
T3		High voltage (TTL15)	6-003-0407
	or	High voltage (TTL15/875)	6-003-0464
	or	High voltage (TTL15/AV)	6-003-0404
	or	High voltage (TTL15/AM)	6-003-0496
	or	High voltage (TTL12)	6-003-0436
	or	High voltage (TTL15/C)	6-003-0446
	or	High voltage (TTL15/1029)	6-003-0408
T101		Horizontal driver	1-017-5380
	or	Horizontal driver (TTL15/0, TTL15/AM, TTL15/C, TTL15/1029)	1-017-5395
		ZENER DIODE	
VR101		1N754A	78-15-0754
VR102		1N5526	1-021-0449

SYMBOL	DESCRIPTION	BBRC PART NUMBER
	MISCELLANEOUS	
V1	15 inch CRT	
	Assembly, main chassis board (TTL15)	6-002-0525
	Assembly, main chassis board (TTL15/0)	6-002-0560
	Assembly, main chassis board (TTL15/C)	6-002-0582
	Assembly, power supply module (TTL15/1029, TTL15/875)	6-003-0412
	Assembly, main chassis board (TTL12)	6-002-0569
	Assembly, main chassis board (TTL12 W/Brt control)	6-002-0574
	Assembly, main chassis board (TTL15 W/Brt control)	6-002-0551
	Assembly, switchable power supply module	6-003-0424
	Assembly, heatsink (TTL15/0)	6-003-0434
	Assembly, heatsink (TTL15/AM, TTL15/1029, TTL15/C)	6-003-0446
	Assembly, heatsink	6-003-0396
	Assembly, heatsink (TTL15/875)	6-003-0411
	Assembly, heatsink (TTL15/875)	6-003-0404
	Assembly, main chassis board (TTL15/AV)	6-002-0620
	Assembly, main chassis board (TTL15/1029)	6-002-0589
	Assembly, main chassis board (TTL15/875)	6-002-0537
	Assembly, main chassis board (TTL15/AM)	6-002-0638
	Assembly, power supply module (TTL15/C, TTL15/AM)	6-003-0445
	Assembly, power regulator module (TTL15/I)	6-003-0498



VIDEO INPUT
+55 VDC
3/4 A FAST
VERT SYNC INPUT
HORIZ SYNC INPUT
HEIGHT
V LIN
V HOLD
VID GAIN
B+ ADJ
HORIZ CENT
BRIGHTNESS
FOCUS
H V TRANSFORMER
HORIZ DEFL COIL
VERT DEFL COIL
FROM CRT SOCKET
120V 50-60Hz
0.75A
1. ALL RESISTORS 1/4W, 5%. VALUES IN OHMS.
3. □ DENOTES PC CARD EDGE CONNECTOR.
SELECT AT TEST
OPTIONAL BRIGHTNESS CONTROL.
8 MOLEX DETAIL
R174 & C136 ARE PART OF PW ASSY.
11. REF NO'S NOT USED: R173, C124, R162
PRODUCTION VERSION
AA
TTL SERIES
1-024 0528


GENERAL NOTES: UNLESS OTHERWISE SPECIFIED.
1. ALL RESISTORS 1/4 W, 5%, VALUES IN OHMS.
2. ALL CAPACITOR VALUES IN MICROFARADS.
4. ⌐ DENOTES MOLEX CONNECTOR.
SELECT AT TEST.
8. MOLEX DETAIL
R174 & C136 ARE PART OF PW ASSY.
VIDEO INPUT
VERT SYNC INPUT
HORIZ SYNC INPUT
HEIGHT
V LIN
V HOLD
VID GAIN
BRIGHTNESS
HORIZ CENT
VERT DEFL COIL
HORIZ DEFL COIL
FROM CRT SOCKET
TABLE
SCHEMATIC

INSTRUCTION MANUAL ADDENDUM

MODEL EFFECTED: TV-15 and TTL Series

SUBJECT: 100-240V Low Voltage Power Supply

This is an optional supply module for use on the TV15 & TTL series data display and is capable of operating from input line voltages of 100V, 120V, 220V or 240V, 50/60Hz.

The power supply input voltage is determined by the setting of the two slide switches located at the rear of the supply. These switches are stamped to indicate the appropriate line voltage setting.

To set the supply for a particular line voltage, the numbers on the two switches are added together. This enables the supply to be set for four different input line voltages. The position of the switches and the resultant input voltages are:

S2 Position	S3 Position	AC Line Voltage
0	100	100
20	100	120
0	220	220
20	220	240

When changing input voltage from 100/120 to 220/240 volt, the fuse (F1) must also be changed.

FUSE SIZE TABLE

Input Voltage	Fuse Size
100/120V	3/4A-125V slo-blo
220/240V	3/8A-250V slo-blo

PART LIST ADDENDUM

T1	Power Transformer	1-017-5400
S2	Switch, Slide, SPDT	1-018-0255
S3	Switch Slide, 3PDT	1-018-0256
	Power Supply Module	6-003-0424

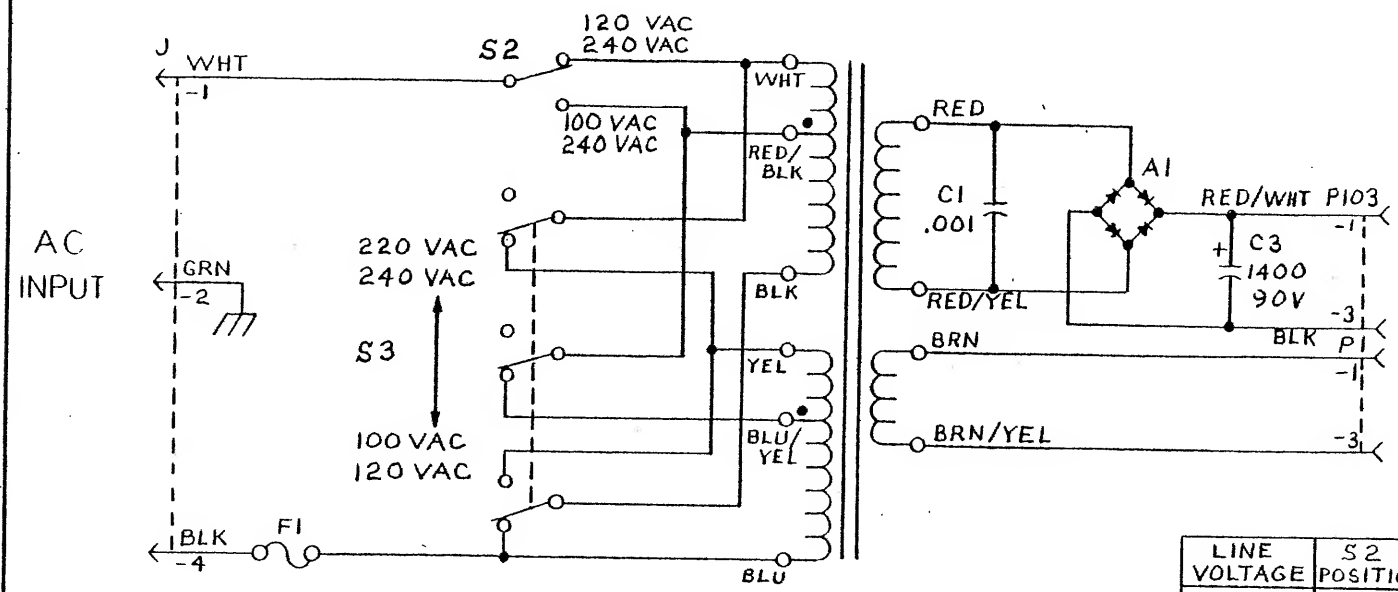


FIG 1: SWITCHING SYSTEM FOR VARIABLE INPUT LINE VOLTAGE SHOWN IN 120 VAC POSITION.

LINE VOLTAGE	S2 POSITION	S3 POSITION	F1
100	0	100	3/4 A 125V SB
120	20	100	3/4 A 125V SB
220	0	220	3/8 A 250V SB
240	20	220	3/8 A 250V SB

MATERIAL

FINISH

TOLERANCES UNLESS OTHERWISE SPECIFIED			
DECIMALS	TOL.±	FRACTIONS	TOL.±
.XX	.030	0 TO 6	1/32
.XXX	.020	6 TO 24	1/16
.XXXX	.010	ABOVE 24	1/8
DIMENSIONS ARE IN INCHES			
THREADS-CLASS # 2 FIT AFTER PLATING			
ANGULAR TOL. ± 2°			
DO NOT SCALE DRAWING			

BALL BROTHERS RESEARCH CORP. MIRATEL DIVISION 1633 TERRACE DRIVE SAINT PAUL, MINNESOTA 55113

	SIGNATURE	DATE
DRAFTSMAN	R D Thomas	4-14-75
CHECKER	T W Kelton	4-16-75
DESIGNER		
ENGINEER		4-8-75

TITLE: SWITCHABLE POWER SUPPLY TV-15 & TTL SERIES

SIZE	DRAWING NO.	REV.
B	1-024-0547	A

USED ON	SCALE	SHEET
TV-15	NONE	1 OF 1

ETHERNET

An Ethernet is the principal means of communications between an Alto and the outside world. The object was to design a communication system which could grow smoothly to accommodate several buildings full of personal computers and the facilities needed for their support. The Ethernet is a broadcast, multi-drop, packet-switching, bit-serial, digital communications network: it connects up to 256 nodes, separated by as much as 1 kilometer, with a 2.94 megbits/sec. channel. Control of the Ethernet is distributed among the communication computers to eliminate the reliability problems of an active central controller, to avoid a bottleneck in a system, rich in parallelism, and to reduce the fixed costs which make small systems uneconomical.

The Ethernet is intended to be an efficient, low-level packet transport mechanism which gives its best efforts to delivering packets, but it is not error free. Even when transmitted without source-detected interference, a packet may not reach its destination without error; thus, packets are delivered only with high probability. Stations requiring a residual error rate lower than that provided by this bare packet transport mechanism must follow mutually agreed upon packet protocols.

Alto Ethernets come in three pieces: the transceiver, the interface, and the microcode. The transceiver is a small device which taps into the passing Ether, inserting and extracting bits under the control of the interface while disturbing the Ether as little as possible. The same device is used to connect all types of Ethernet interfaces to the Ether, so the transceiver design is not specific to the Alto, and will not be described here.

When a program wishes to send a packet, it must first turn off the receiver if it is on. If the receiver is actively copying a packet into memory, the transmitter should wait for the reveiver to finish (a maximum of about 1.5 msec. assuming 250-300 word packets). The program can tell whether the receiver is actively transferring or idle by zeroing the first word of the input buffer before starting the receiver. When the program wants to start the transmitter, it checks the first word of the input buffer: if it is still zero, input has not yet begun and the interface may be reset and the transmitter started with a high probability of not missing an incoming packet. There is still a small window between testing the word and starting the transmitter when a packet can arrive and be missed, but paragraph two warned that the Ethernet is not error free anyway, so missing a few more packets should be harmless.

The first word of all Ethernet packets must contain the address to which the packet is destined in the left byte, and the address of the sender (or 'source') in the right byte. Reveivers examine at least the destination byte, and in some cases (not in Altos) the source byte to determine whether to copy the message into memory as it passes by. Address zero has special meaning to the Ethernet. Packets with destination zero are broadcast packets, and all receivers will receive them. If a program wishes to receive all packest on the Ether regardless of address (useful for debugging and diagnostic programs), it should use zero. A host which does this is said to be promiscuous. Address 377 (octal) is reserved for Ethernet booting. Address 376 (octal) is reserved as the destination for diagnostic messages.

ETHERNET HARDWARE

The Ethernet hardware consists of a FIFO buffer, an output shift register and phase encoder, a clock recovery circuit, an input shift register, a CRC register, and one microcode task. Packets on the Ether are phase encoded and transmitter synchronous; it is the responsibility of the receiver to decide where a packet begins (and thus establish the phase of the data clock), separate the clock from the data, and deserialize the incoming bit stream. The purpose of the write register is to synchronize data transfers between the input shift register whose clock is derived from the incoming data, and the FIFO which is synchronous to the processor system clock. The large FIFO is necessary because the Ethernet task has relatively low priority, and the worst case latency from request to task wakeup is on the order of 20 microseconds. The phase encoder uses the system clock (one Ethernet bit time is two clock periods).

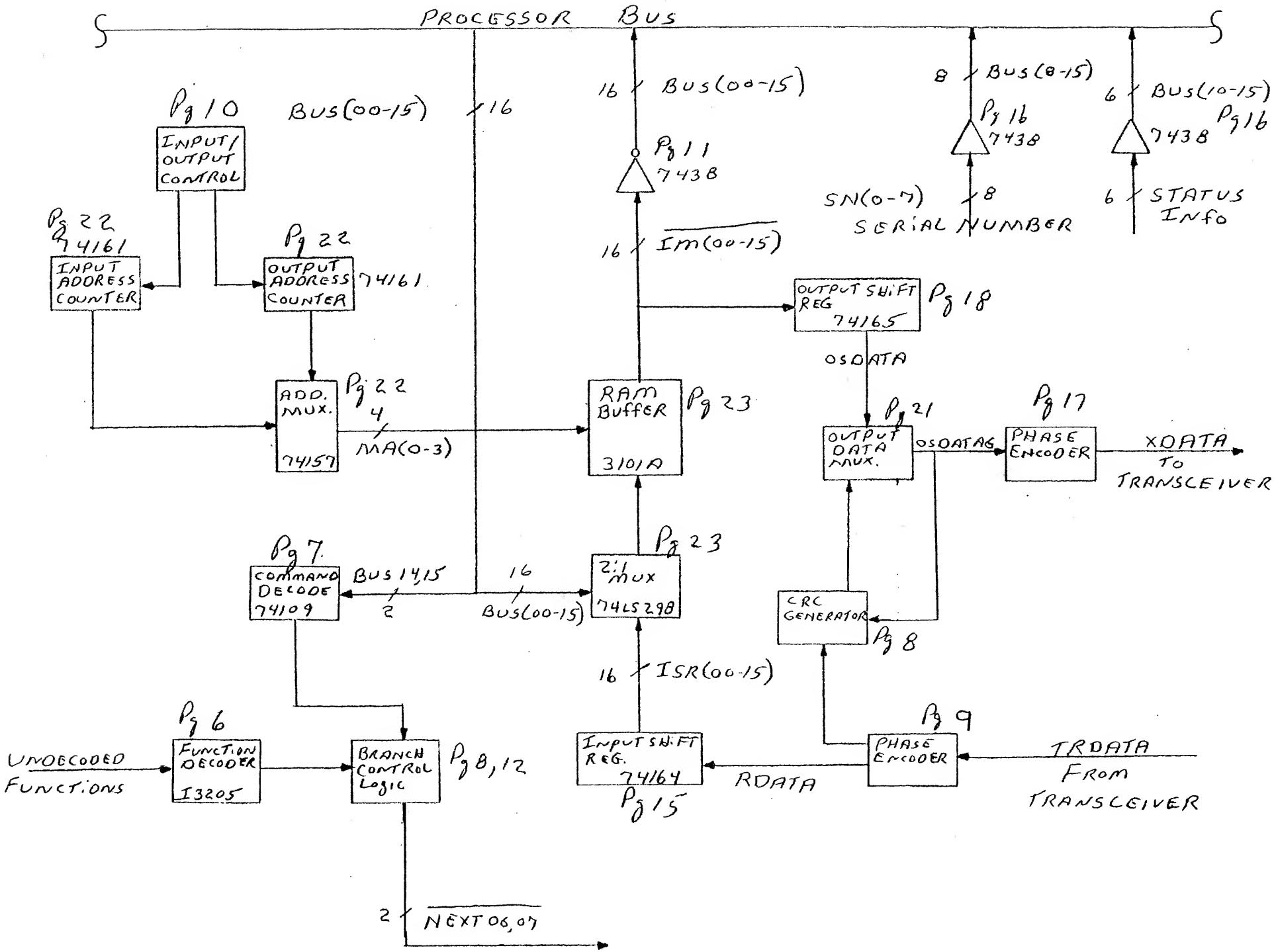
Included in the clock recovery section is a one-shot which is retriggered by each level transition of a passing packet. This detects the envelope of a packet and is called its 'carrier'. Ethernet phase encoders mark the beginning of a packet by prefixing a single 1 bit, called the sync bit, to the front of all transmissions. The leading edge of the sync bit of a packet will trigger the carrier one-shot of a listening receiver and establish the receiver clock phase. The sync bit is clocked into the input shift register and recirculated every 16 bit times thereafter to mark the presence of a complete word in the register. If carrier drops without the sync bit at the end of the register, the transmission was imcomplete, and is flagged in the hardware status bits. When the shift register if full, the word is transferred to the write register where it sits until the FIFO control has synchronized its presence and there is room to accept it. If the shift register fills up again before the word has been transferred from the write register to the FIFO, data has been lost and the input data late flip flop is set.

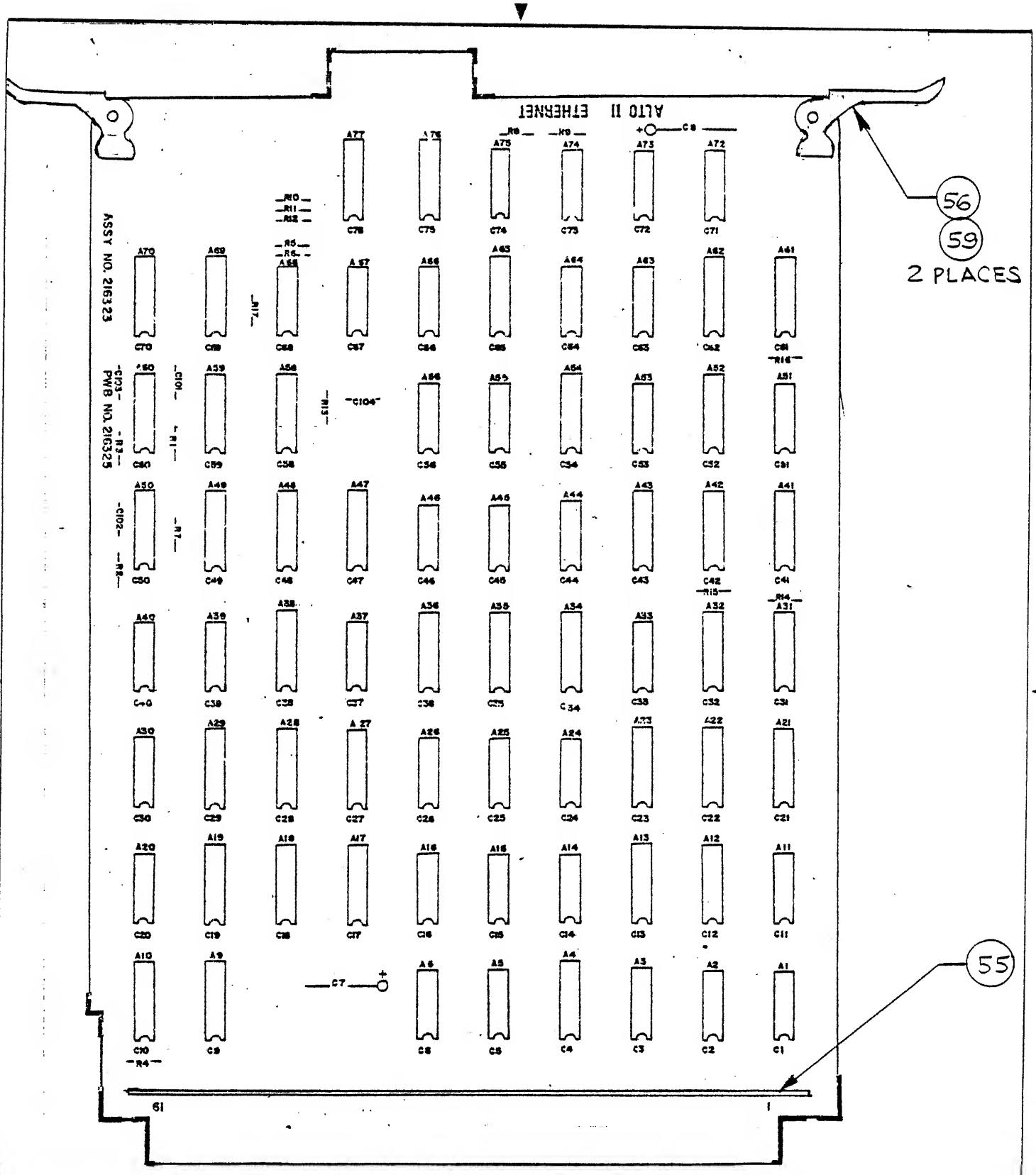
Ethernet transmitters accumulate a 16 bit cyclic redundancy checksum on the data as it is serialized, and append it to an outgoing packet after the last data word. As a receiver deserializes an incoming packet it recomputes the checksum over the data plus the appended CRC word. If the resulting receiver checksum is non-zero, the received packet is assumed to be in error; and the condition is flagged in the hardware status byte.

The phase encoder is started when the microcode has decremented the countdown to zero, there is no carrier present, and either the FIFO is full, or if the message is less than 16 words long, all of it has been transferred to the FIFO. The phase encoder will not start up while there is carrier present. This means that collisions can only happen because of delay in sensing carrier between widely spaced transmitters. Collisions are detected at the transceiver by comparing the data the interface is suppling to the data being received off the Ether. If the two are not identical, a signal is returned to the interface which sets the collision flip flop causing a wakeup request to the microcode which resets the interface.

The interface and the transceiver are connected together by three twisted pairs for signals plus supply voltages and ground supplied from the interface. The signals are (1) transmitted data to the transceiver, (2) received data from the transceiver, and (3) the collision signal from the transceiver indicating interference.

ETHERNET MODULE





Title

ASSEMBLY, PRINTED WIRING-
ETHERNET

Xerox Corporation
El Segundo, California

XEROX

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Sheet 3 Of

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213 679-4511

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Material List

ML	Drawing No.	Rev.
	216323	F

Drawing Title

ALTO II

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ETHERNET

Model No. EWO 7YF92 | Date 3-3-76 | Sheet 4 Of

Rev. | Drawing No. 216323 | ML

Item No.	Drawing Title	Drawing No.	No. Req.	Remarks
1	Board, P.W. Ethernet	216325	1	
2	Procedure, Test	216324	REF	
3	Spec, Module Assembly	216207	REF	
4	Microcircuit, 74H21		2	A1, 39
5	7408		3	A63,64,68
6	7404		3	A3, 44, 55
7	74H01		1	A30
8				
9	7437		1	A73
10	74LS298		4	A13,17,23,27
11	7400		2	A20,46
12	74164		2	A33,37
13	74165		2	A34,36
14	7402		2	A40,72
15	74174		1	A43
16	74157		2	A48,54
17	74123		2	A50,60
18	7410		2	A56,74
19	74161		2	A58,59
20	74S86		1	A67
21	74S08		1	A2
22	7438		8	A5,6,14,15,16,24,25,26
23	74S37		1	A11
24	74S00		3	A45,75,66
25	74S157		1	A76
26	898-1-R1.0K Beckman		3	A4,32,38
27	I3205 Intel		3	A9,19,29
28	I3101A Intel		4	A12,18,22,28
29	P3601 M.I.L. OR TN473		3	A41,42,49
30	Microcircuit, 9401 Fairchild		1	A53
31	Microcircuit, 74109		13	A10,21,31,35,47,51, 52,61,62,65,69,70,77

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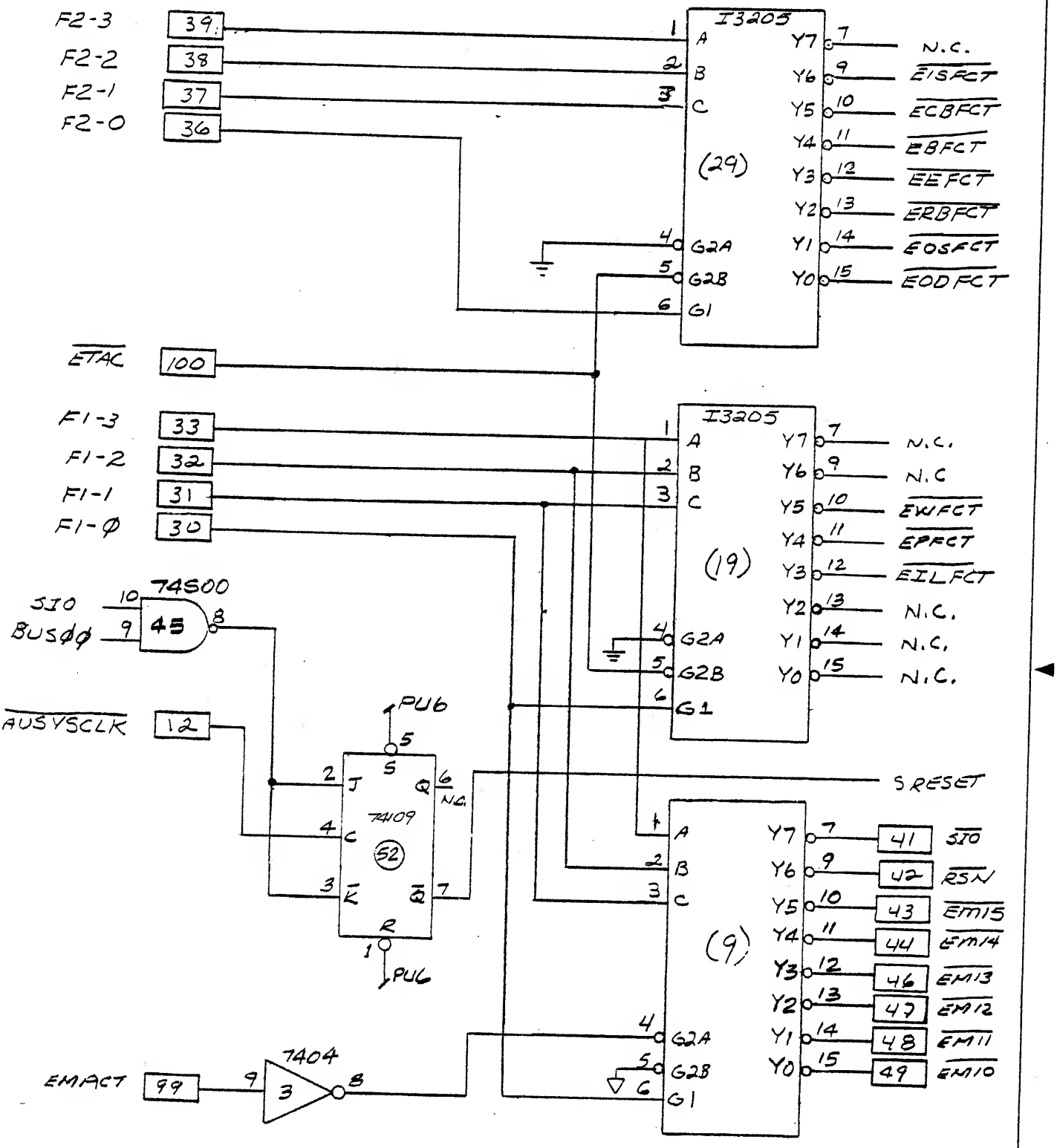
Model No. EWO 7YF92 | Date 3-3-76 | Sheet 5 of

Rev. | Drawing No. 216323 | ML

Item No.	Drawing Title	Drawing No.	No. Req.	Remarks
34	Capacitor, .05 µF, 10V, Centralab UK-10-503		71	C1-6, 9-56, 58-76
35	Capacitor, 47 pF Nytronics DC-470		2	C101, 103
36	Capacitor, 68 pF Nytronics DC-680		1	C102
37	Capacitor, 2200 pF Nytronics DC-		1	C104
38	Capacitor, Tant., 22uF +20%, 15V	187720-005	1	C7
39	Capacitor, Tant., 18uF ±20%, 50V	123300-186	1	C8
40				
41	Resistor, Film, 1K, ±5%, 1/4W	116447-102	7	R4, 12, 13, 14, 15, 16, 17
42	5.1K,	512	2	R2, 7
43	200Ω	201	2	R6, 11
44	270Ω	271	2	R5, 10
45	12K	123	1	R1
46	20K	203	1	R3
47				
48	120Ω	121	1	R9
49	330Ω	331	1	R8
50	10Ω	100	1	R18
51	Resistor, Film, 470Ω ±5%, 1/4 W	116447- 471	1	R19
52				
53				
54				
55	Stiffener	216242	1	
56	Extractor, Module	216250	2	
57	Socket, Microcircuit		33	Augat #514-AG 11D
58	Socket, Microcircuit		40	Augat #516-AG 11D
59	Rivet	156111-005	2	



COMMAND DECODING

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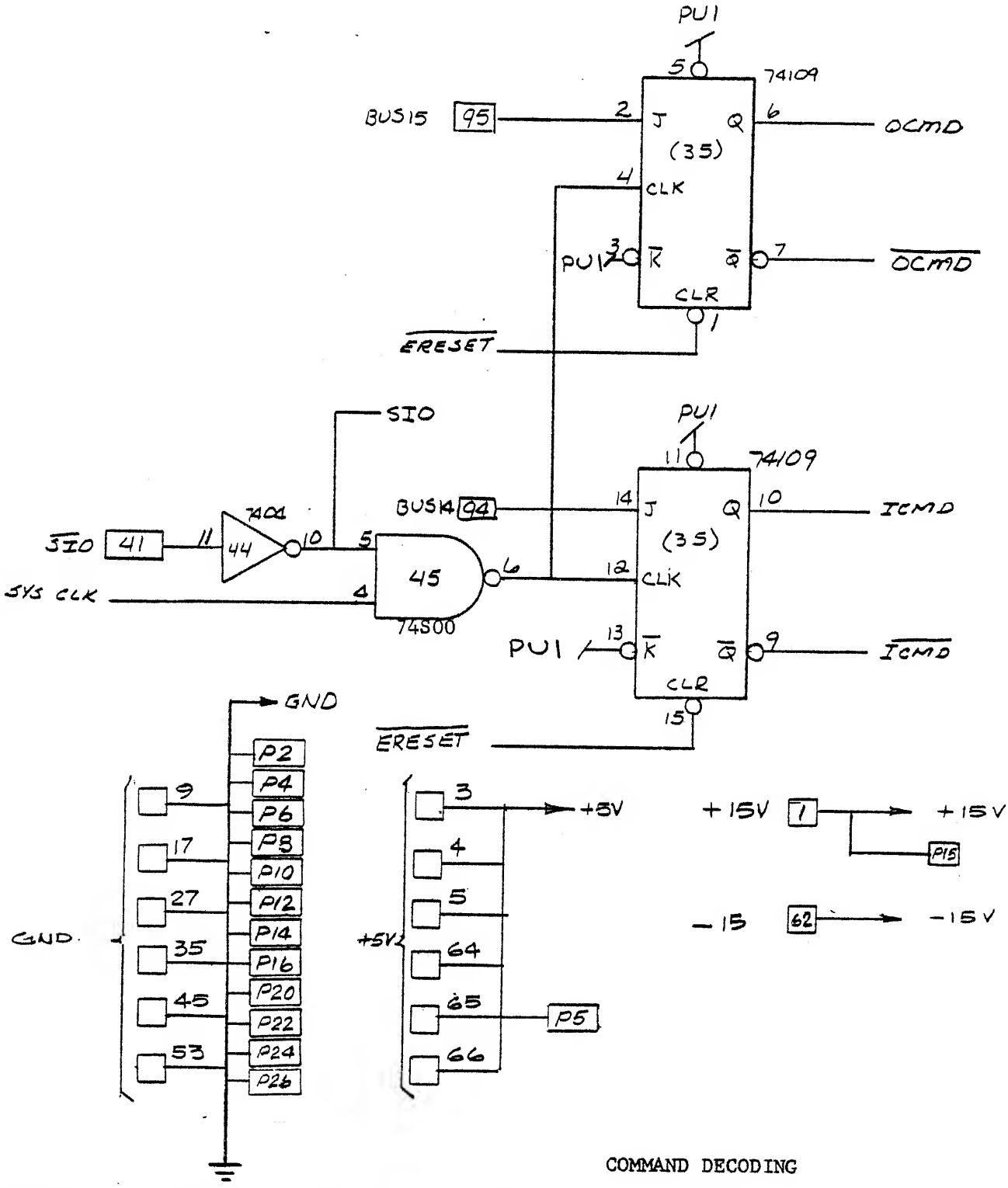

COMMAND DECODING

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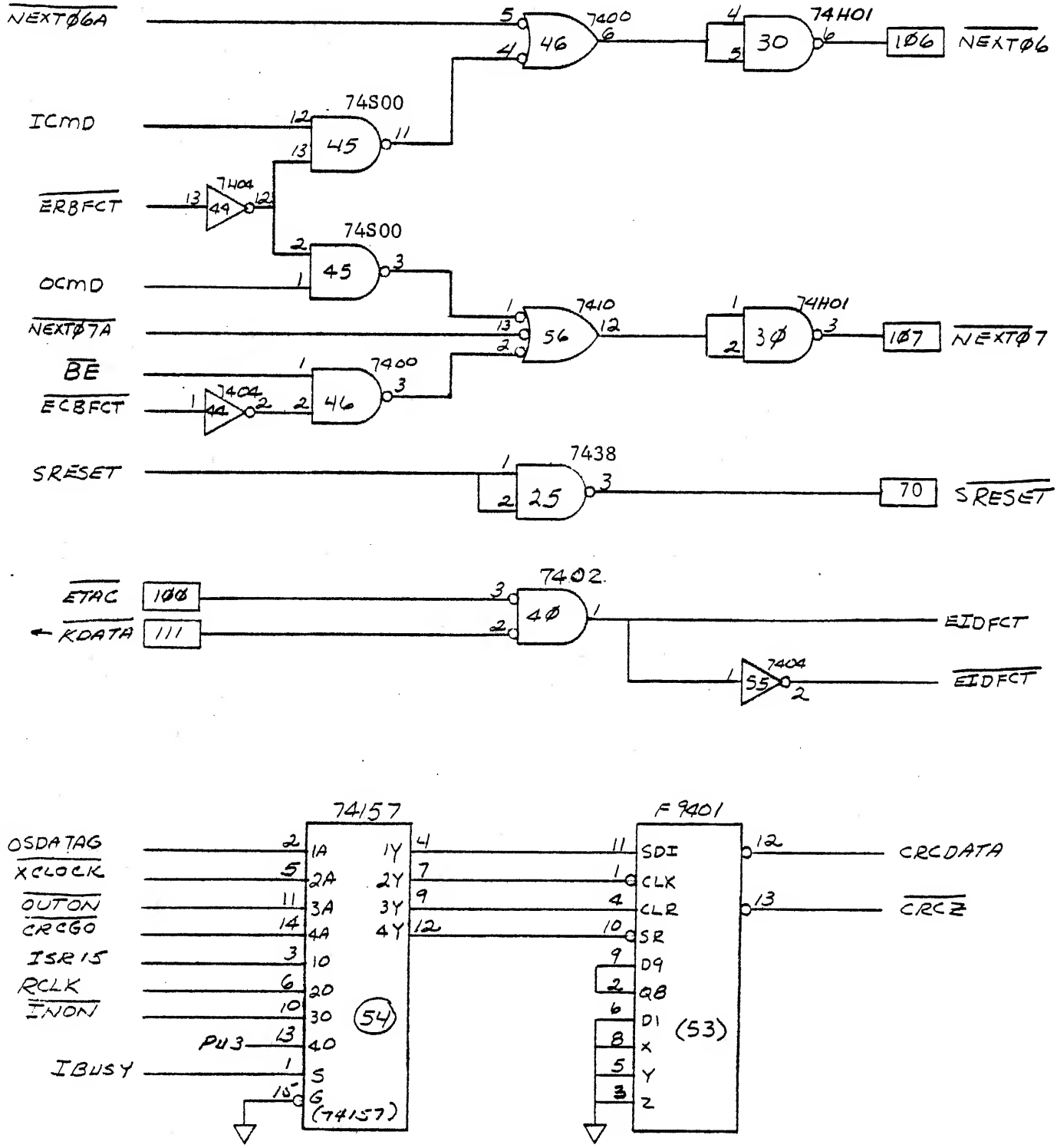

BRANCH LOGIC

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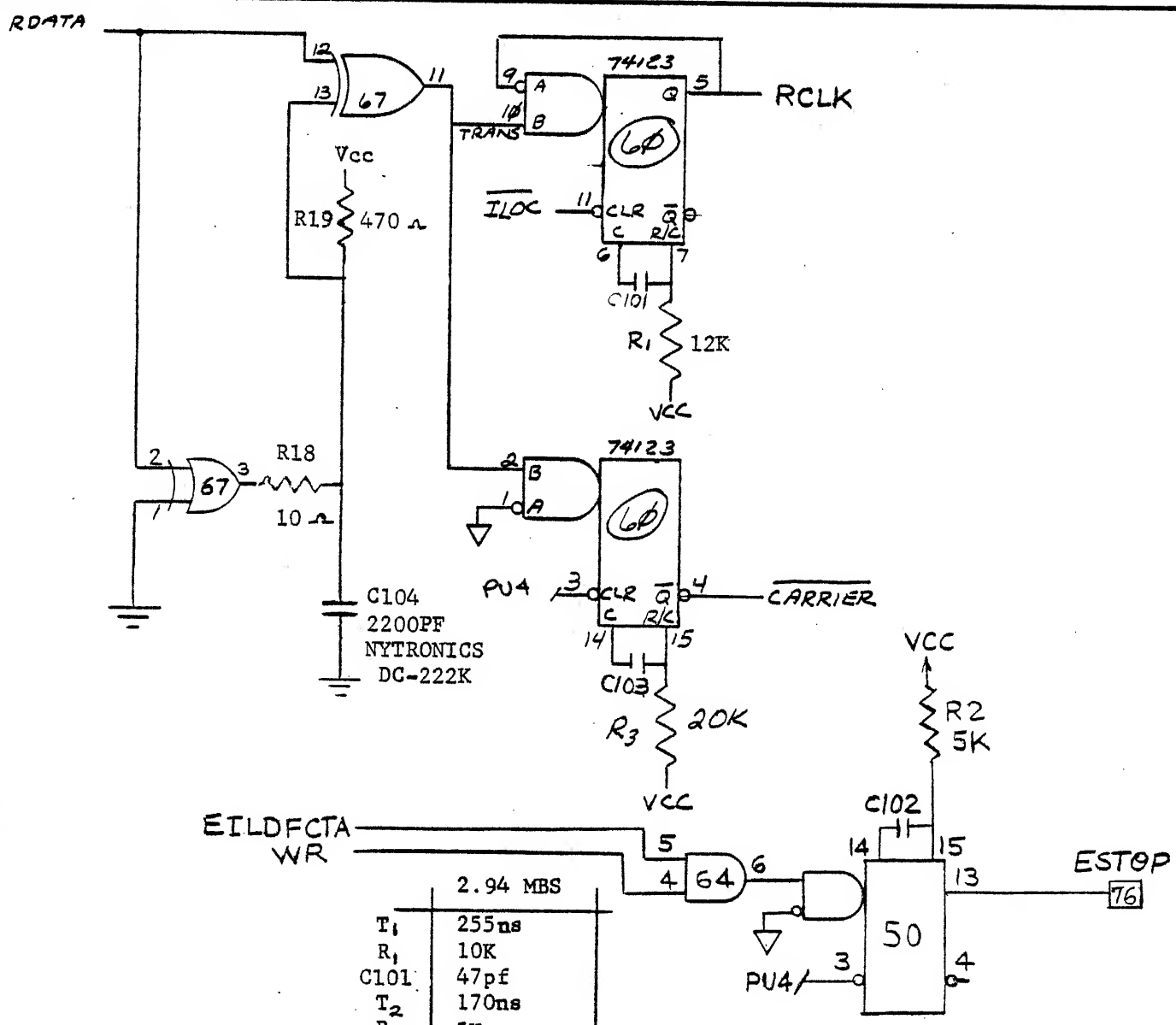

	2.94 MBS
T_1	255ns
R_1	10K
C101	47pf
T_2	170ns
R_2	5K
C102	68pf
T_3	425ns
R_3	20K
C103	39pf
C104	2200Pf
R18	10 Ω
R19	470 Ω

Title

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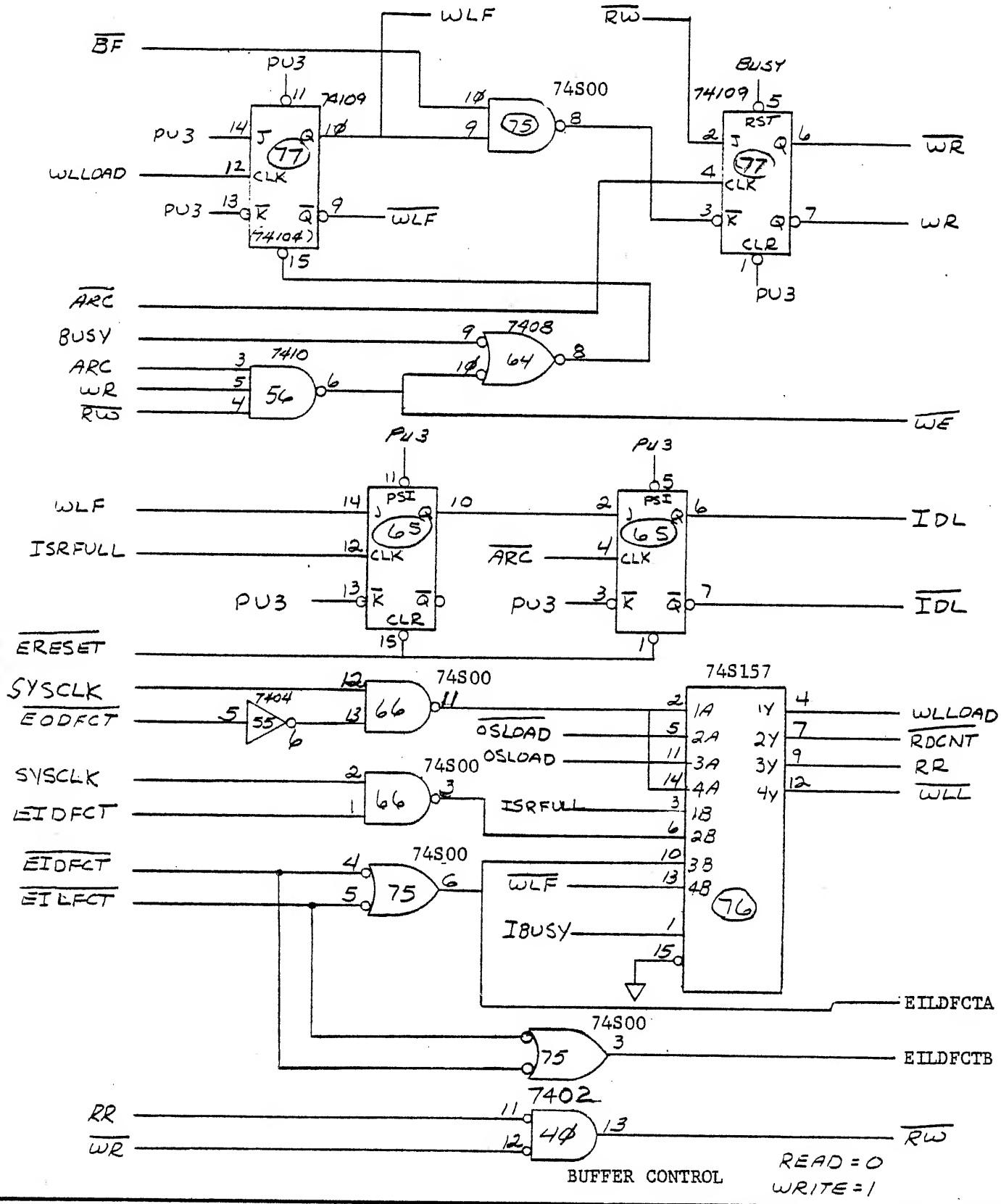

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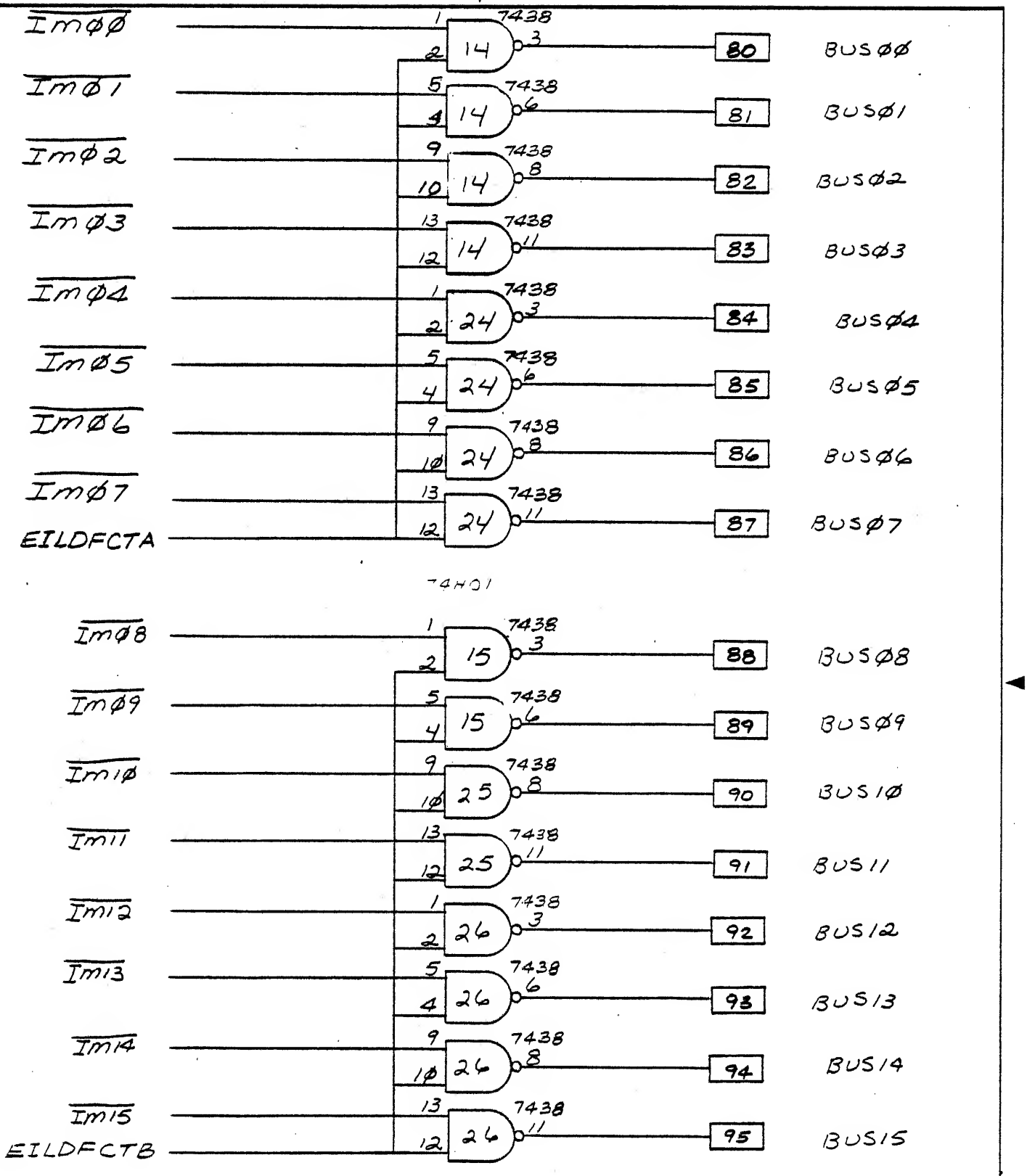

PROCESSOR BUS DRIVERS

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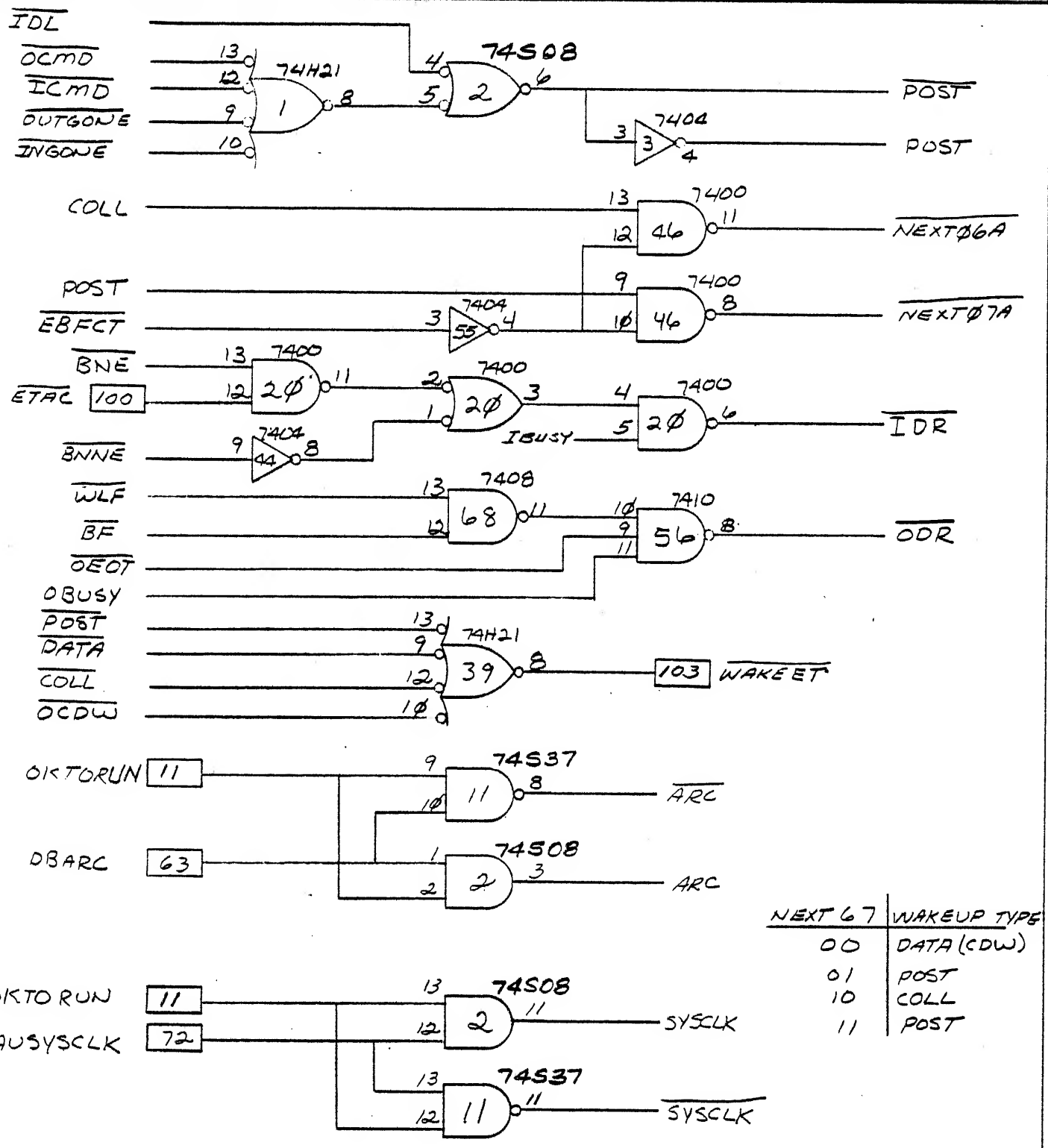

NEXT 67	WAKEUP TYPE
00	DATA (CDW)
01	POST
10	COLL
11	POST

ALTO INTERFACE

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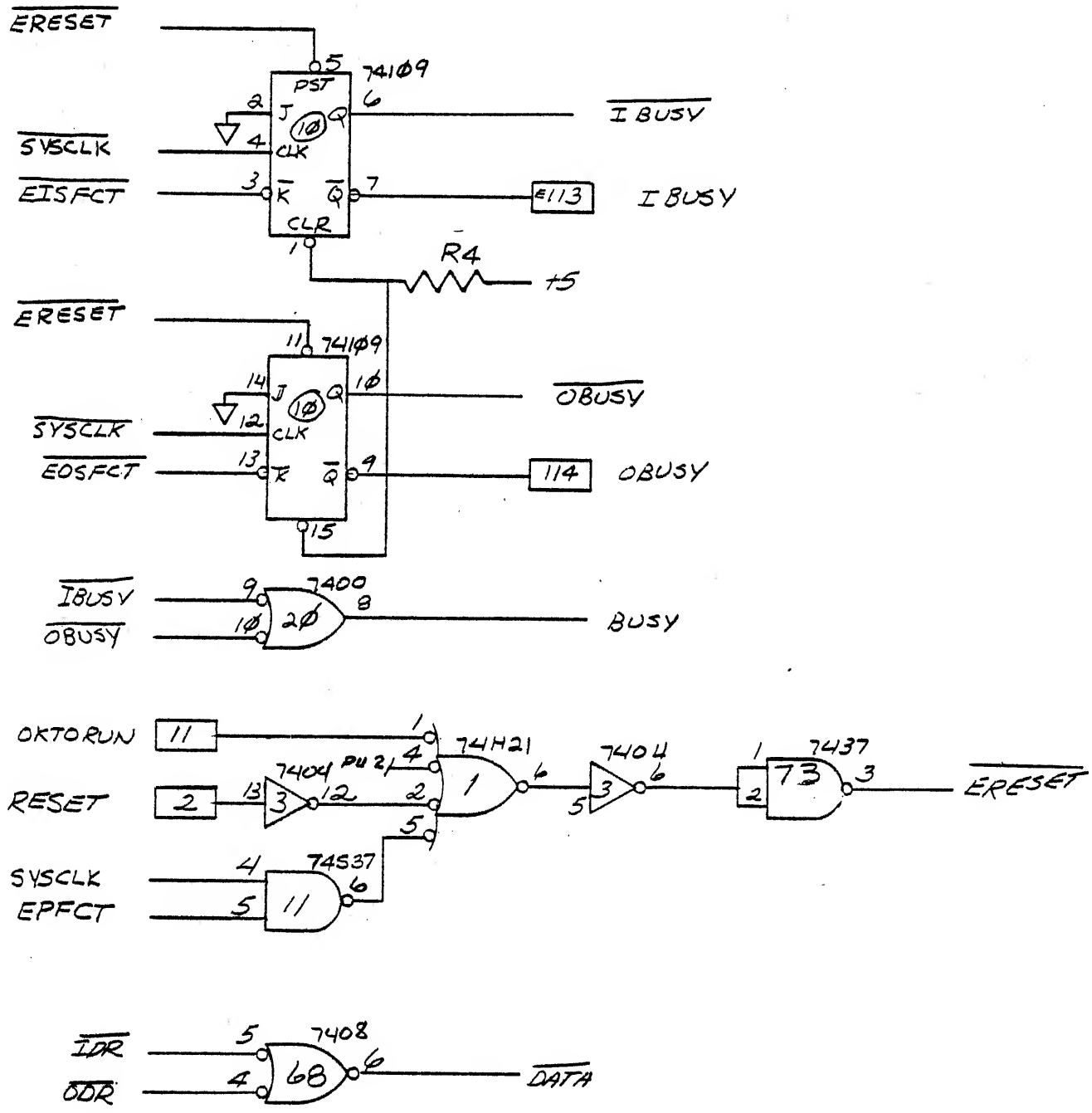

ALTO INTERFACE

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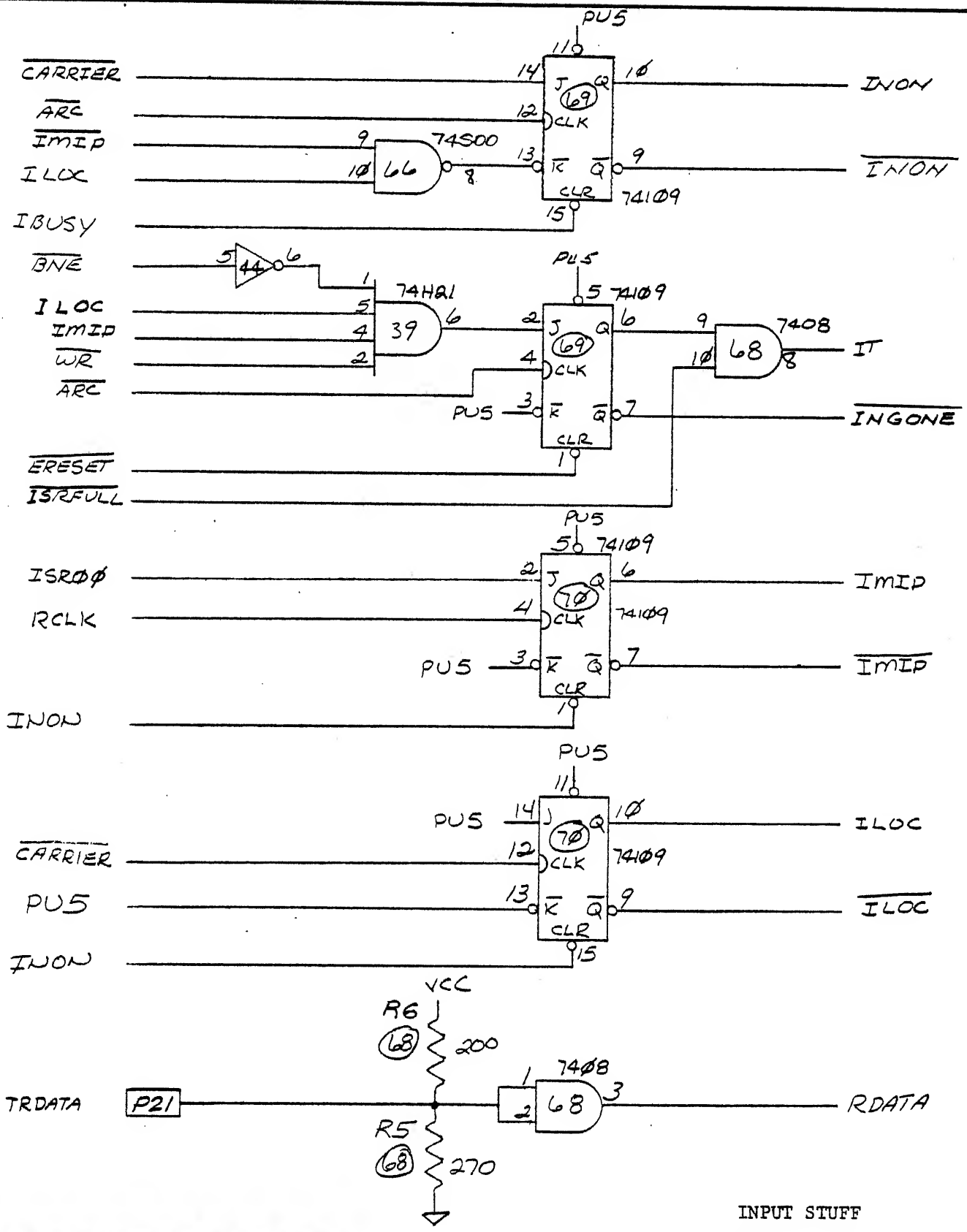

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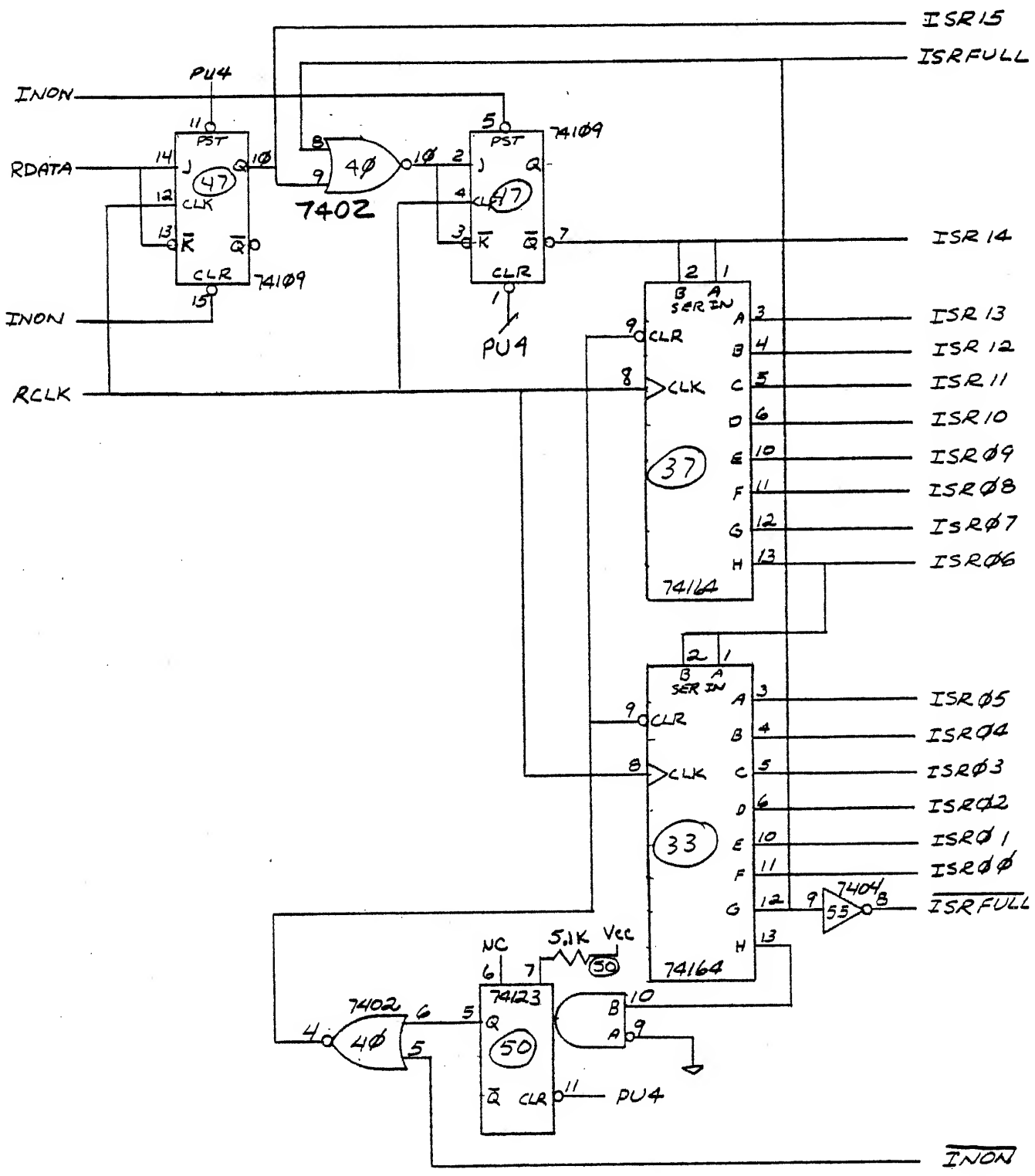

INPUT SHIFT REGISTER

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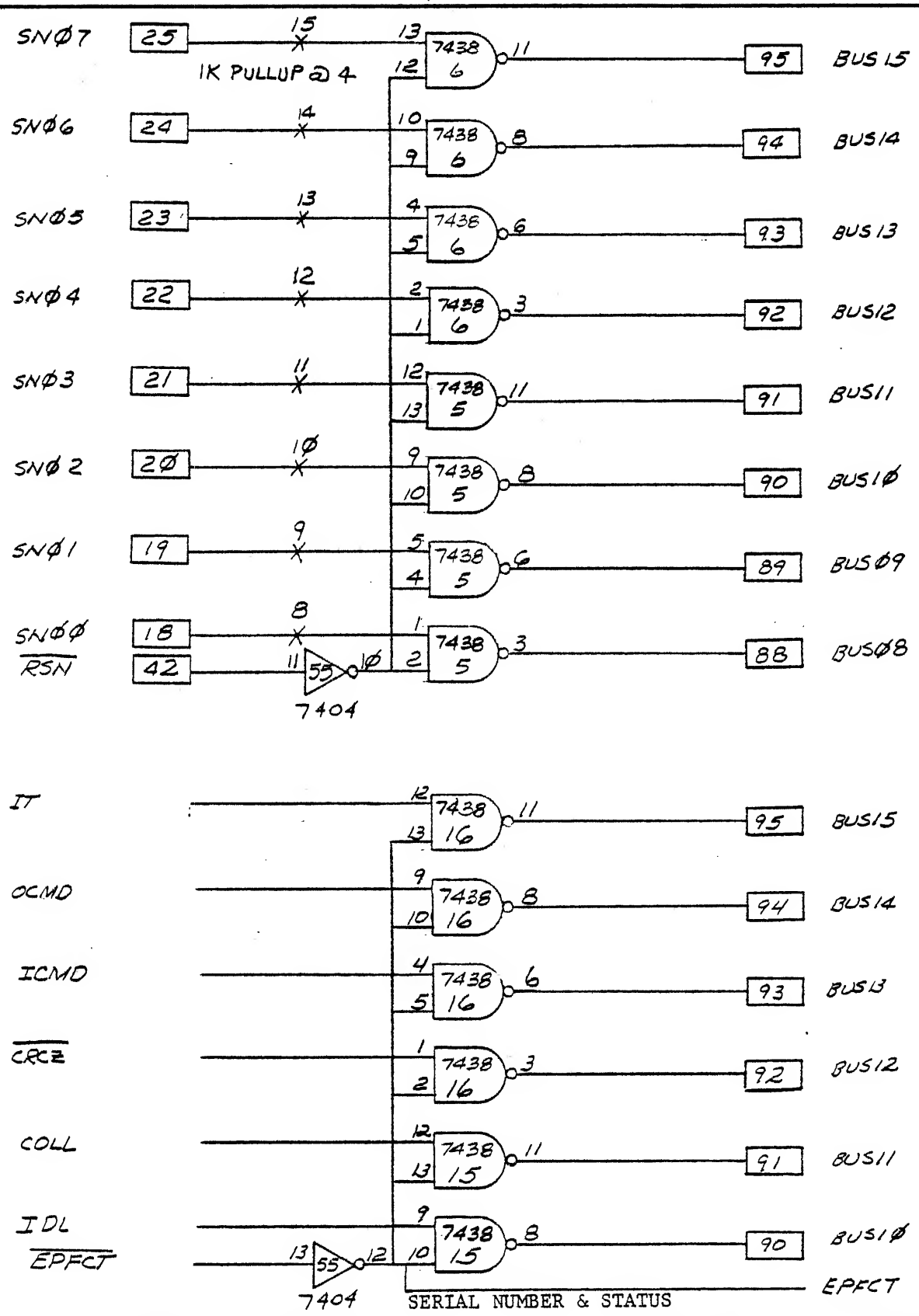


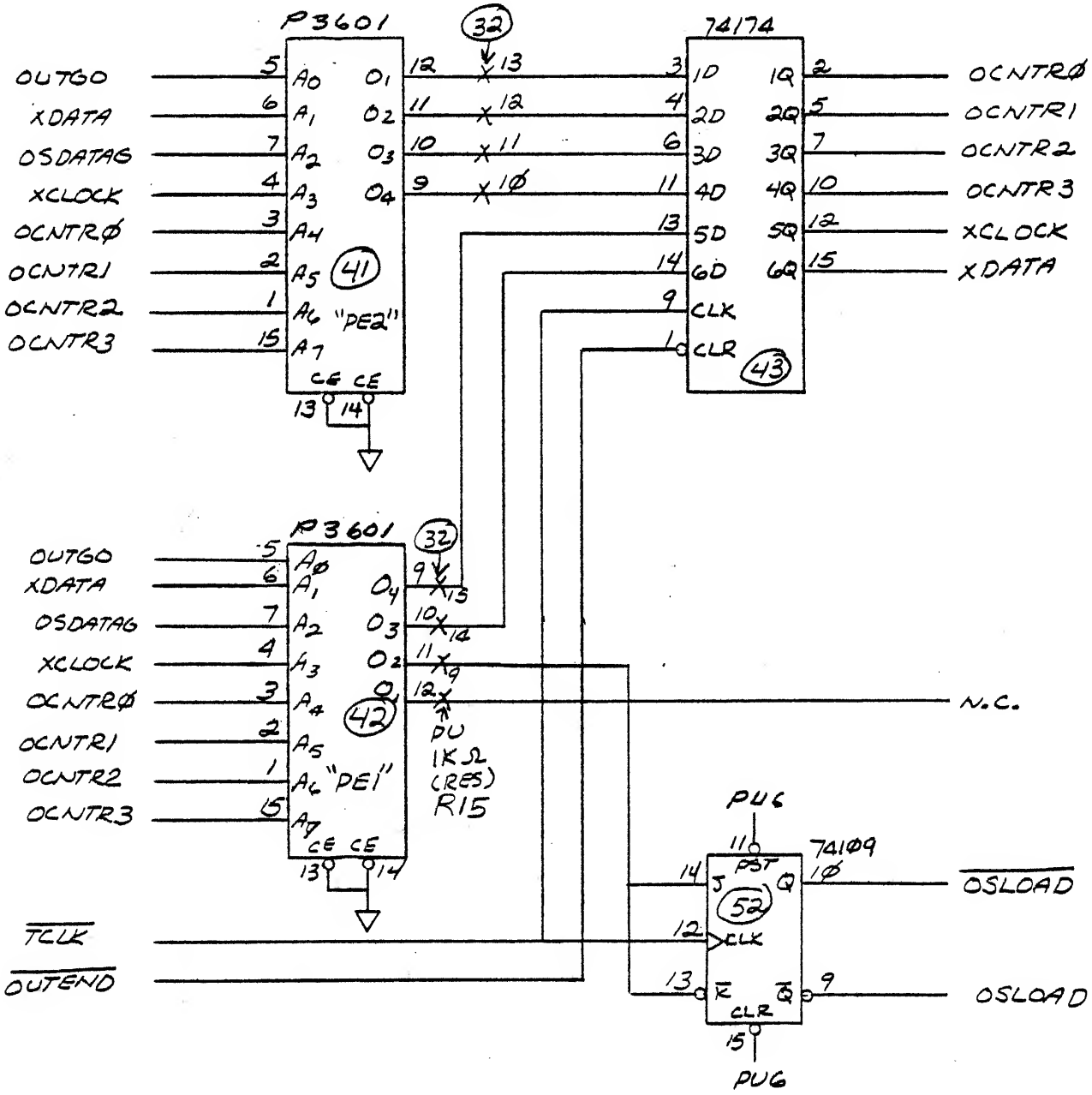
Title
ALTO II
ASSEMBLY, PRINTED WIRING
ETHERNET

Xerox Corporation
El Segundo, California

XEROX

216323 F

Sheet 16 of



OUTPUT S.R. & PHASE ENCODER

Title
ALTO II
ASSEMBLY, PRINTED WIRING
ETHERNET

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El Segundo, California

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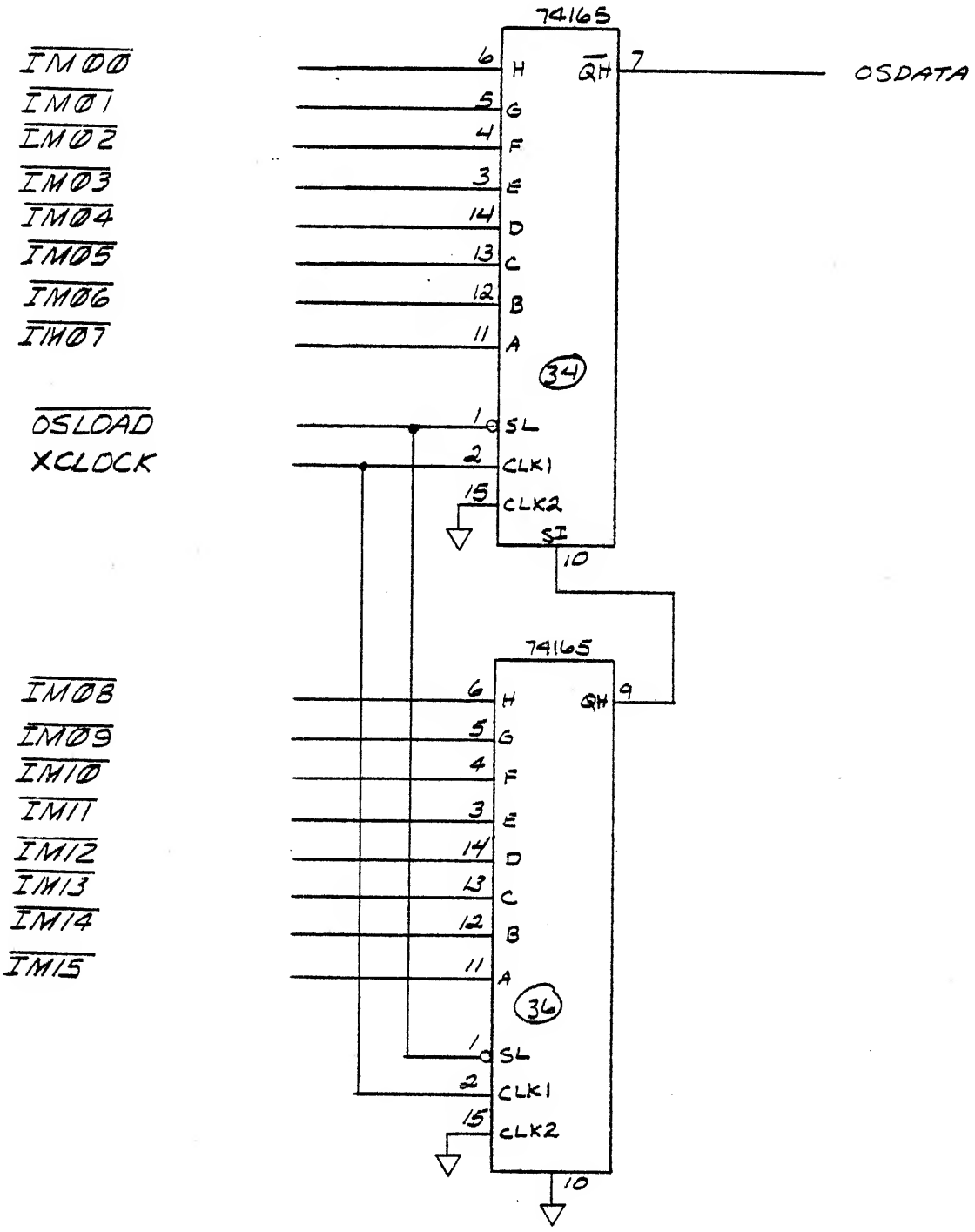

OUTPUT S.R. & PHASE ENCODER

Title
ALTO II
ASSEMBLY, PRINTED WIRING
ETHERNET

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Sheet 18

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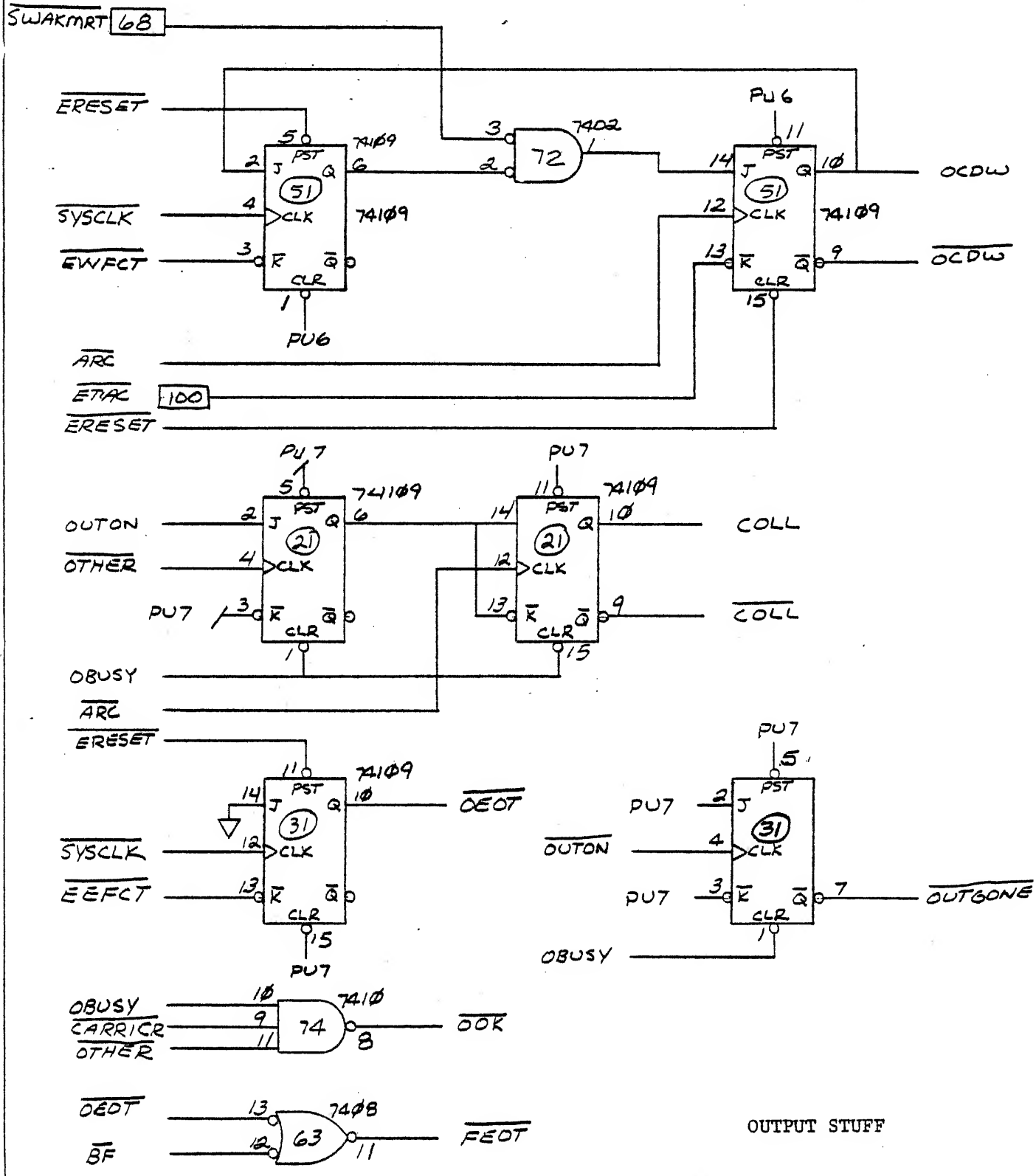

OUTPUT STUFF

Title
ALTO II
ASSEMBLY, PRINTED WIRING
ETHERNET

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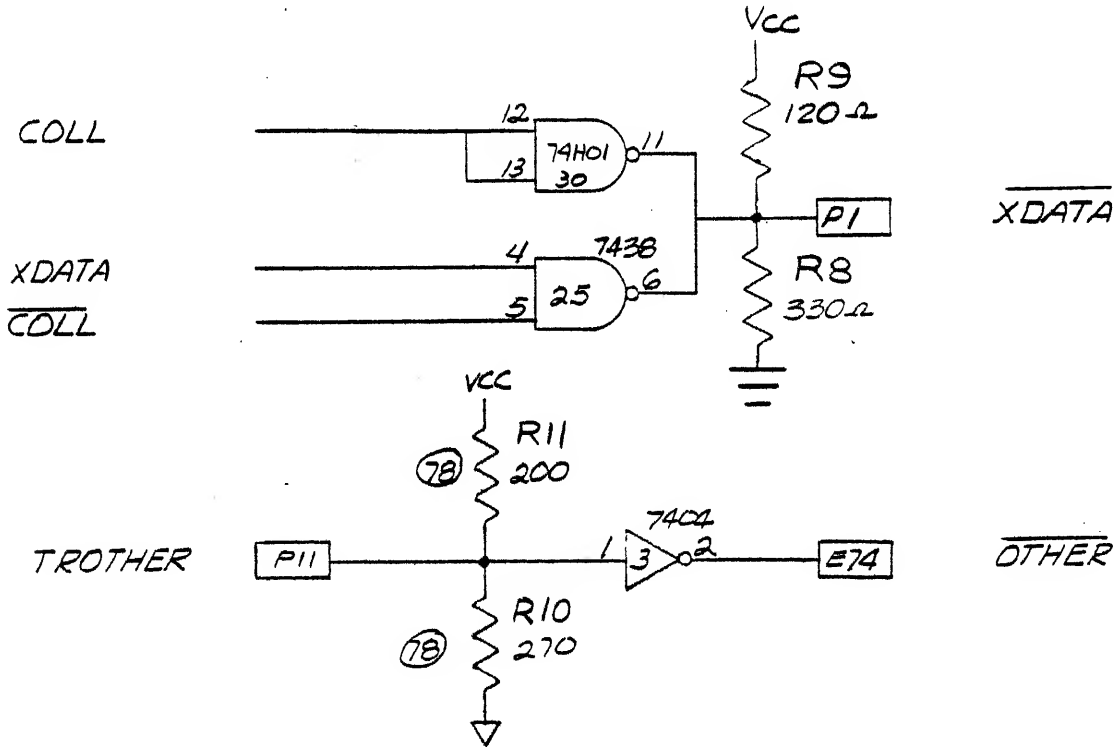

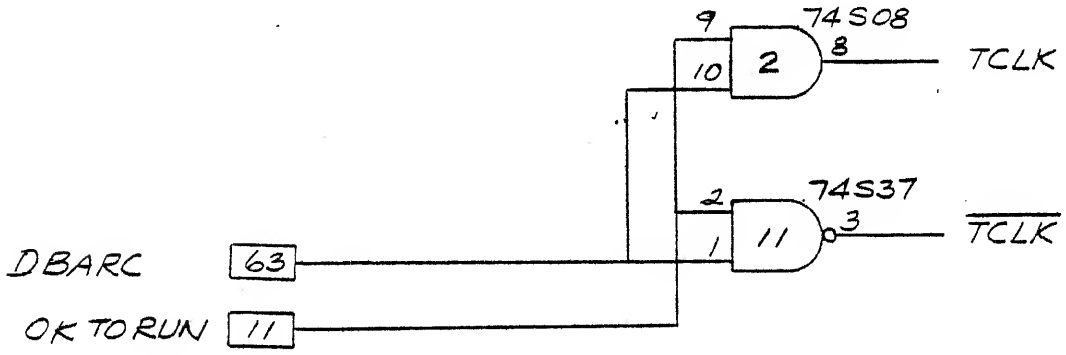

OUTPUT STUFF

Title
ALTO II
ASSEMBLY, PRINTED WIRING
ETHERNET

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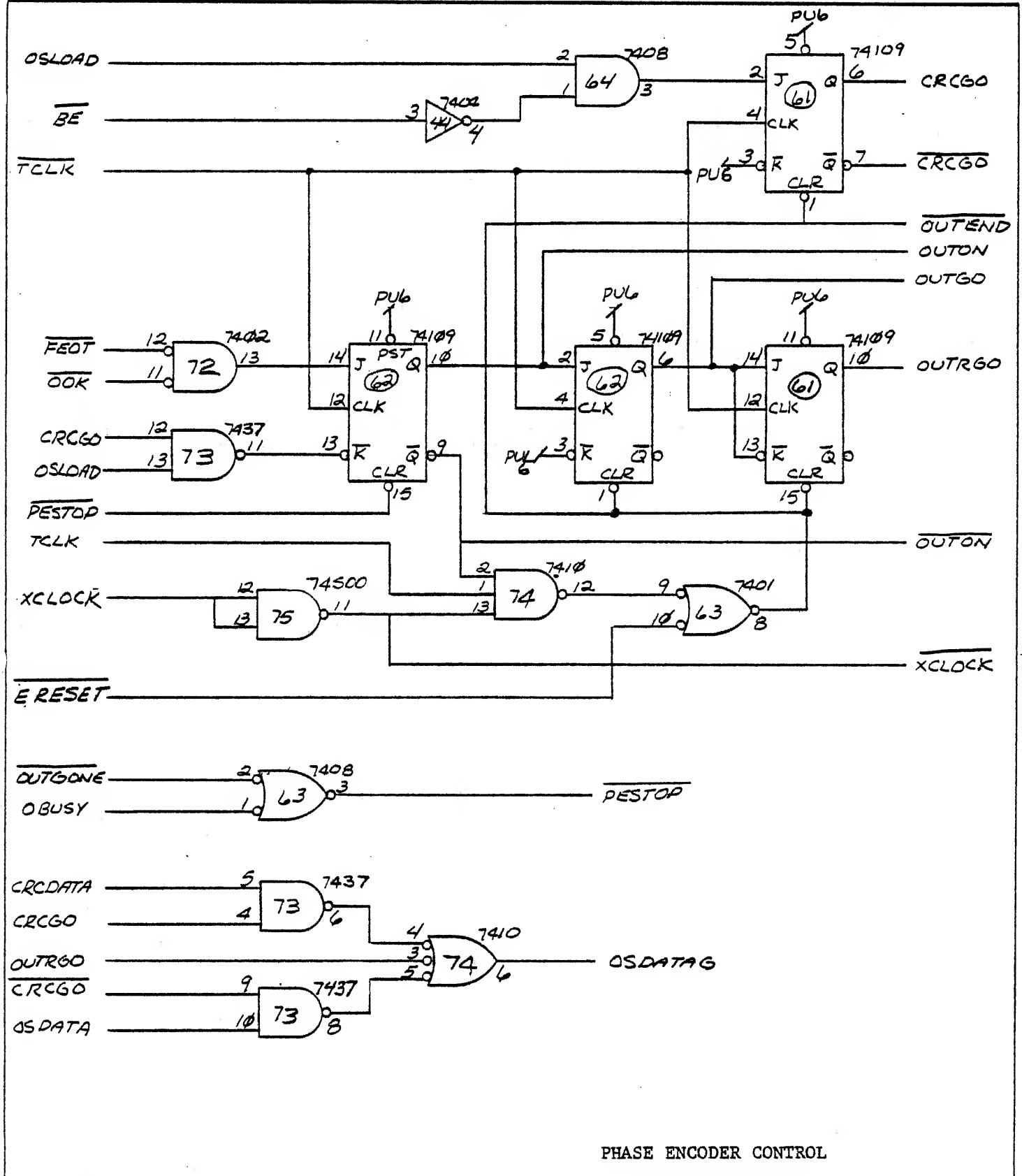
216323 F

Sheet 20 of



PHASE ENCODER CONTROL

Title
ALTO II
ASSEMBLY, PRINTED WIRING
ETHERNET

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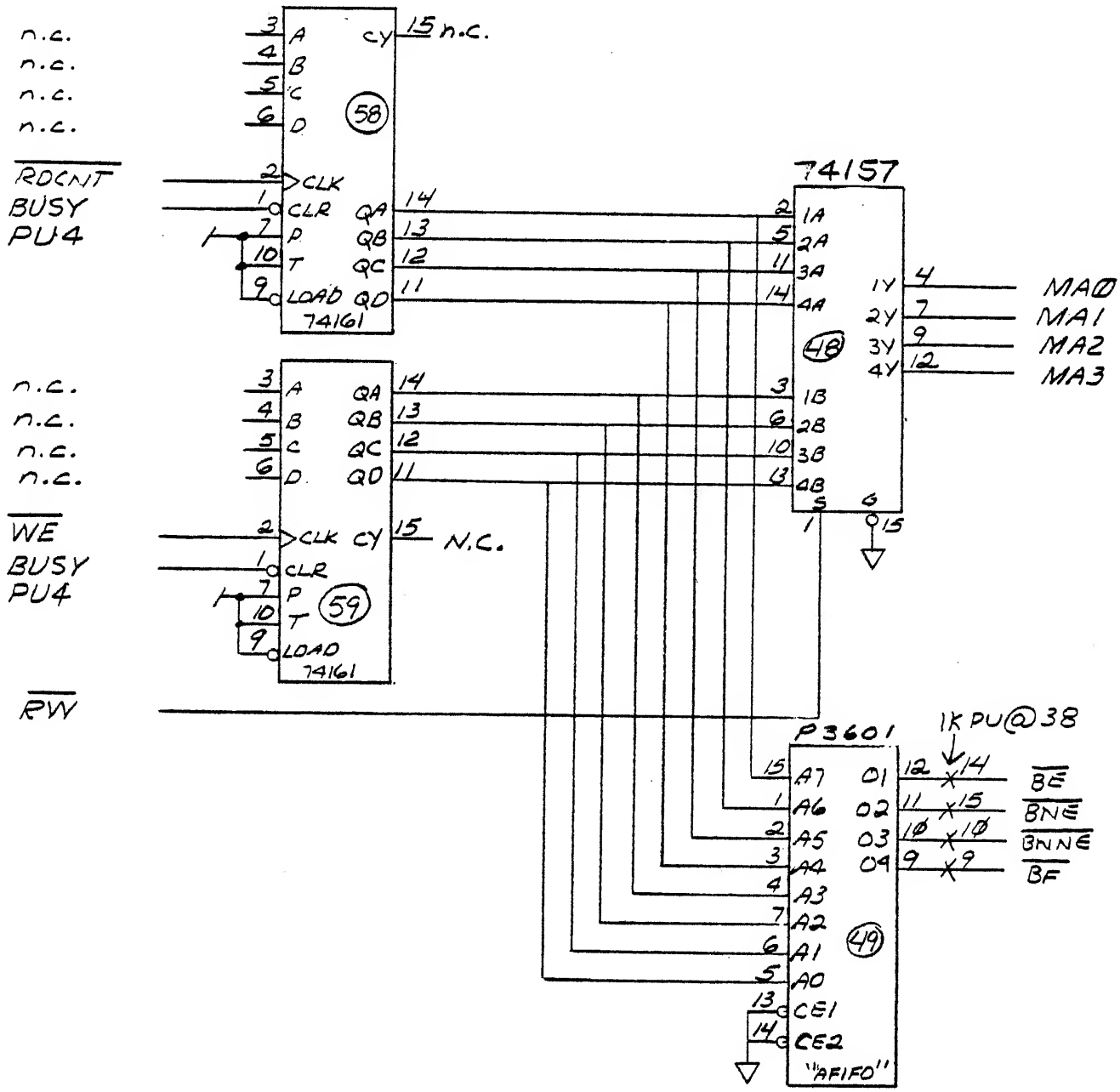

HALF DUPLEX BUFFER

Title
ALTO II

ASSEMBLY, PRINTED WIRING
ETHERNET

Xerox Corporation
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Sheet 22

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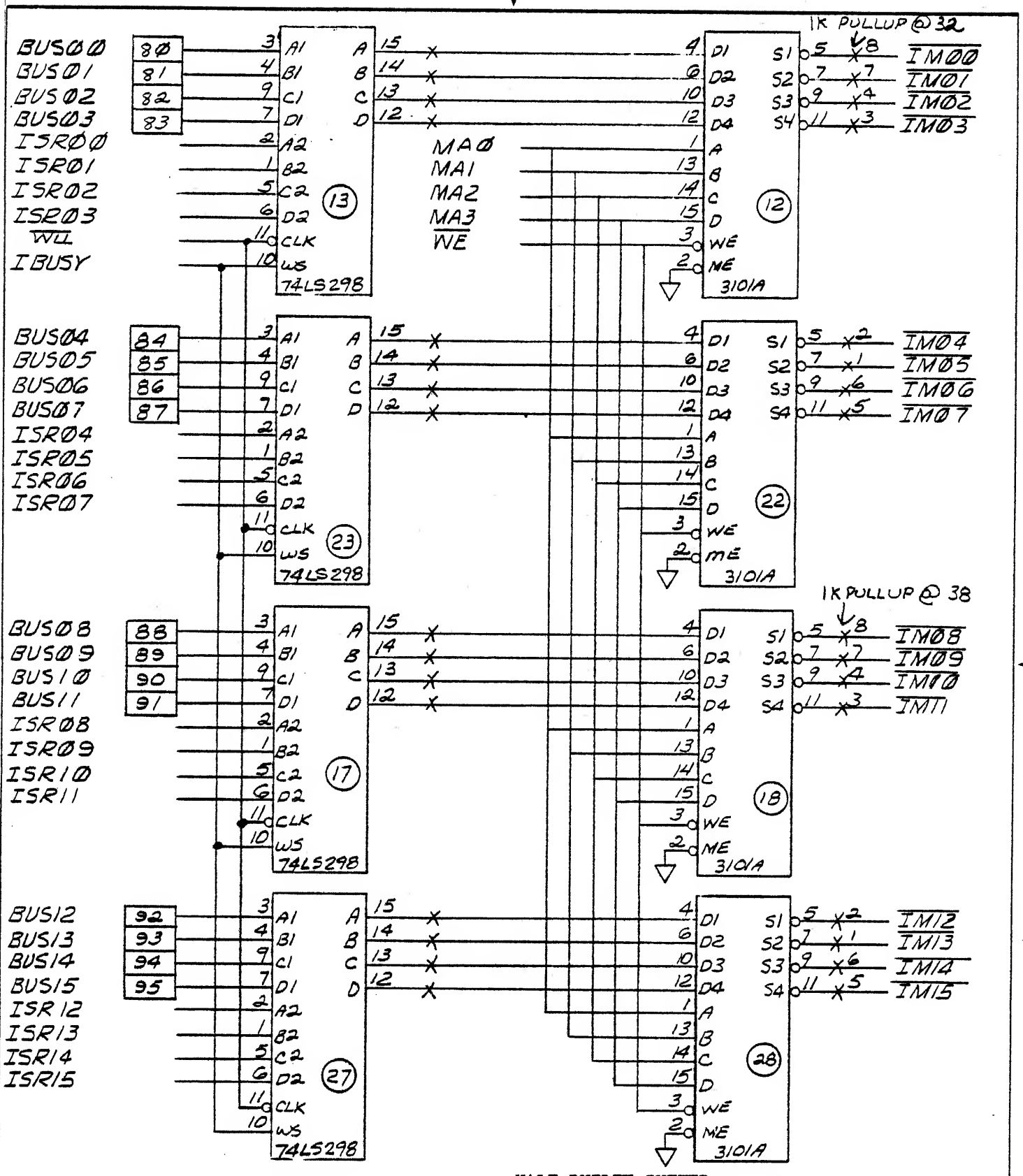

HALF DUPLEX BUFFER

Title

ALTO II

ASSEMBLY, PRINTED WIRING

ETHERNET

Xerox Corporation
El Segundo, California

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Sheet 23 Of

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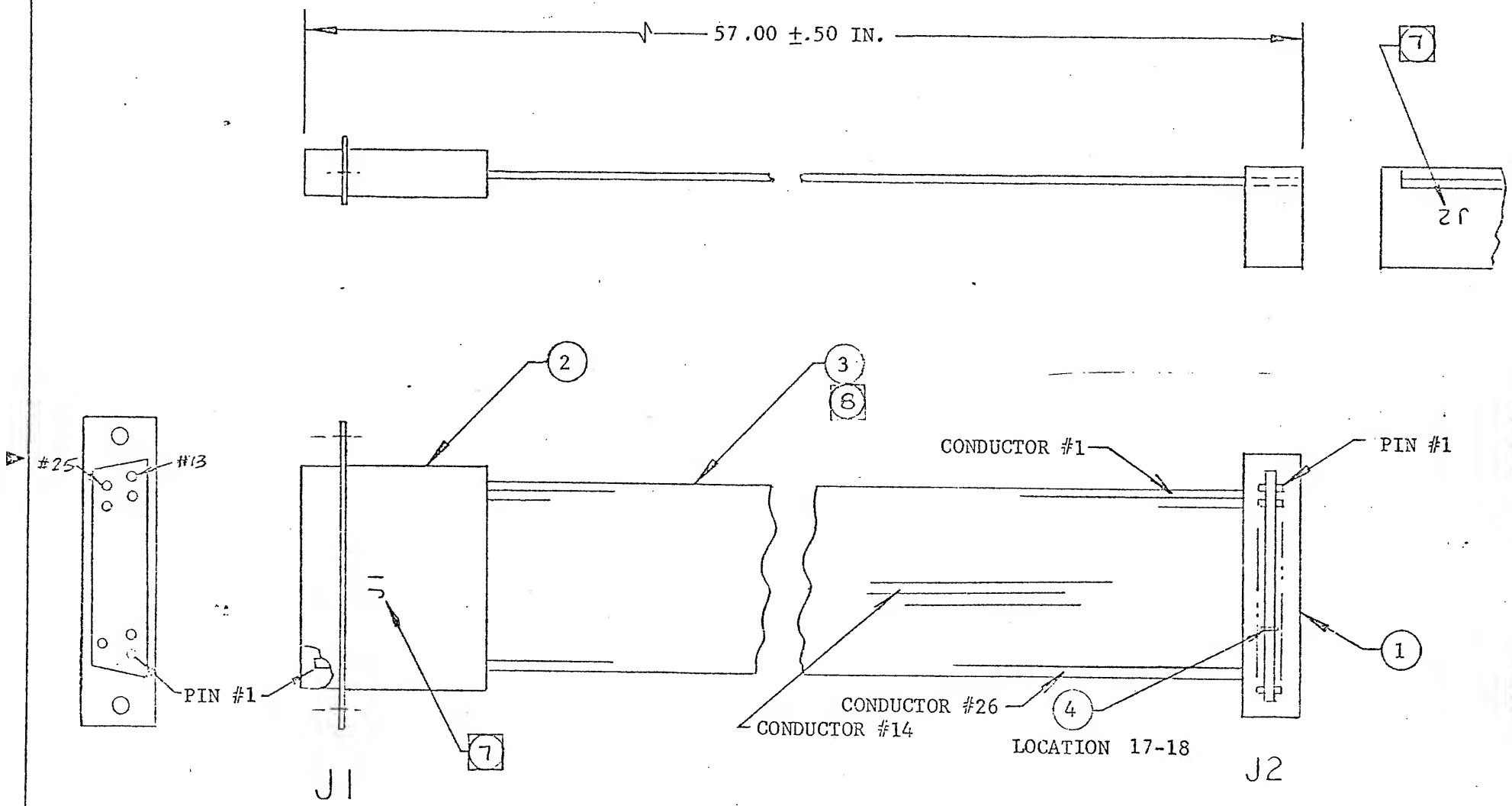

Title

ALTO II

ASSEMBLY, CABLE - ETHERNET

(INTERNAL)

Xerox Corporation
El Segundo, California

XEROX

216413 C

Sheet 3 Of 5

11/(1/73)

Wire No.	Term	From	To	Term	Wire Type	Notes	Signal	Chg. Let.
1		J1 - 13	J2 - 1		3			
2		25	2					
3		12	3					
4		24	4					
5		11	5					
6		23	6					
7		10	7					
8		22	8					
9		9	9					
10		21	10					
11		8	11					
12		20	12					
13		7	13					
14		-	14			(8)		
15		19	15					
16		6	16					
17		18	17					
18		5	18					
19		17	19					
20		4	20					
21		16	21					
22		3	22					
23		15	23					
24		2	24					
25		14	25					
26		J1 - 1	J2 - 26		3			

1. Ref Item No's in Applicable Material List.
2. Ref Designations Are Abbreviated. Prefix Each Designation With:

Title

ALTO II

ASSEMBLY, CABLE -

ETHERNET (INTERNAL)

Xerox Corporation
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XEROX

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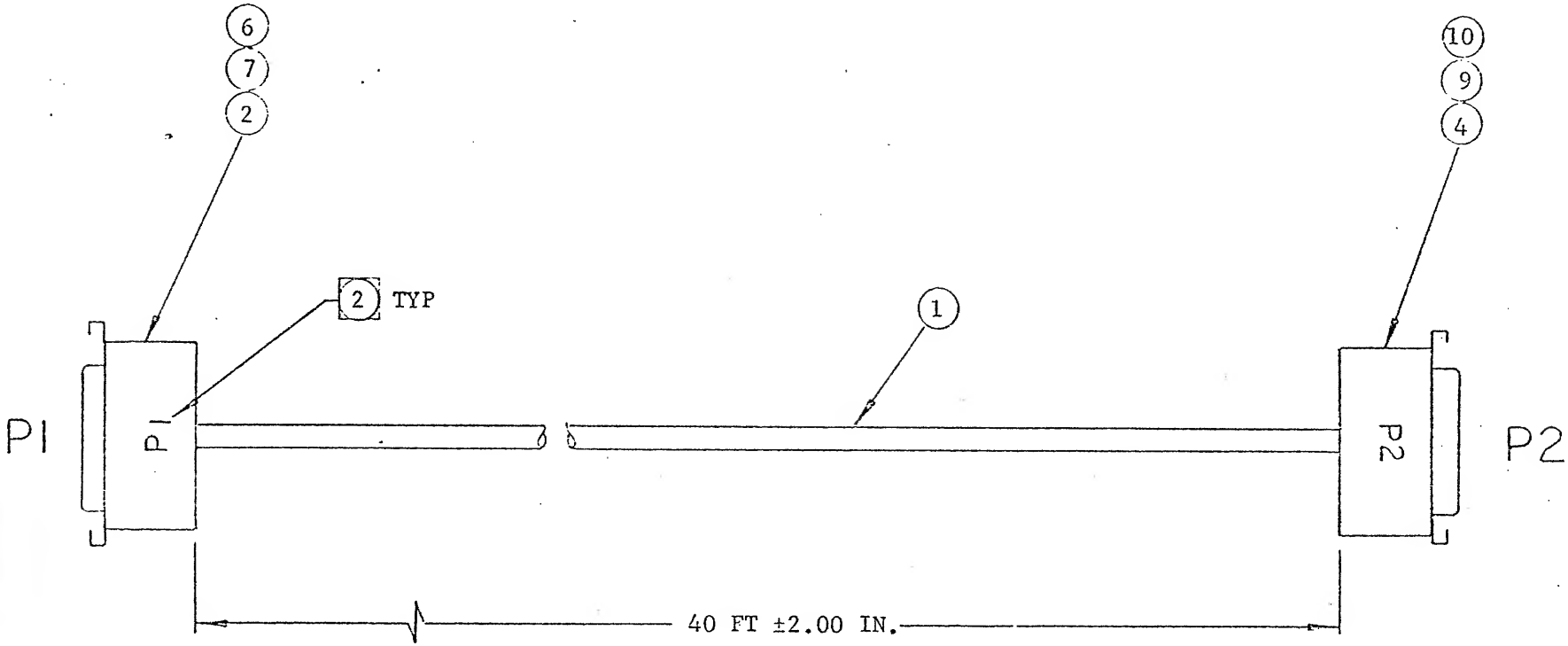
Sheet 5 Of 5



Title

ALTO II

ASSEMBLY, CABLE - ETHERNET (EXTERNAL)

Xerox Corporation
El Segundo, California

XEROX

216411 D

Sheet 3 Of 5

Wire No.	Term	From	To	Term	Wire Type	Notes	Signal	Chg. Let.
1		P1 - 12	P2 - 9		1	BRN } TWISTED	SPARE	
2		24	1			BLK } PAIR	SPARE GND	
3		13	3			GRN }	XDATA	
4		25	4			BLK }	GND	
5		16	5			WHT }	TRDATA	
6		3	6			BLK }	TRDATA GND	
7		8	7			BLU }	TROTHER	
8		20	15			BLK }	TROTHER GND	
9		11	10			RED }	+5V	
10		23	11			BLK }	+5V GND	
11		19	13			YEL } TWISTED	+15V	
12		P1 - 6	P2 - 14		1	BLK } PAIR	+15V GND	

1. Ref Item No's in Applicable Material List.
2. Ref Designations Are Abbreviated. Prefix Each Designation With:

Title
ALTO II
ASSEMBLY, CABLE -ETHERNET
(EXTERNAL)

Xerox Corporation
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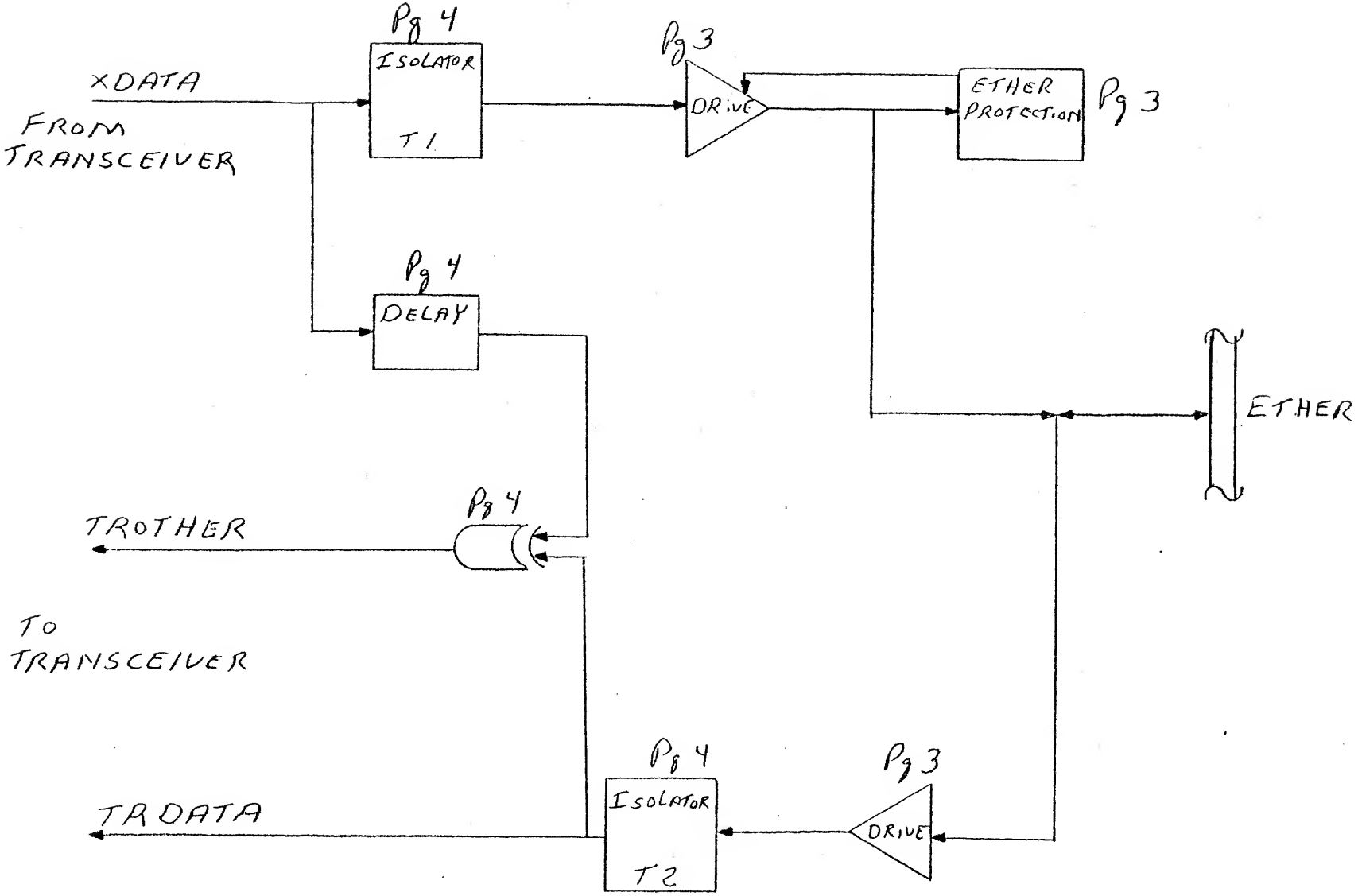
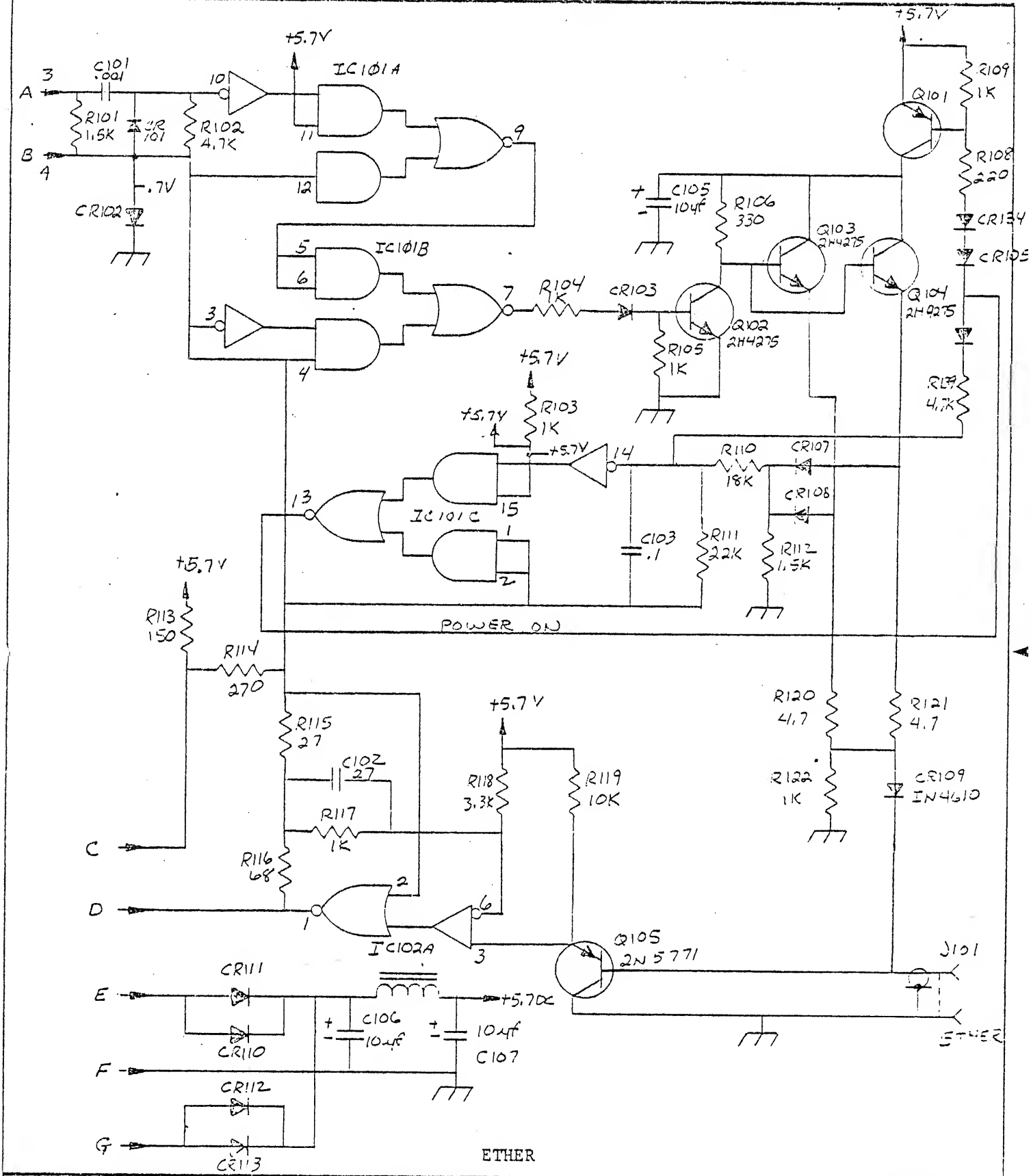
Sheet 5 of 5

ETHERNET RANSCEIVER





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SPEC, PROCUREMENT-
ETHERNET TRANSCEIVER

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209926 B

Sheet 3 of 4

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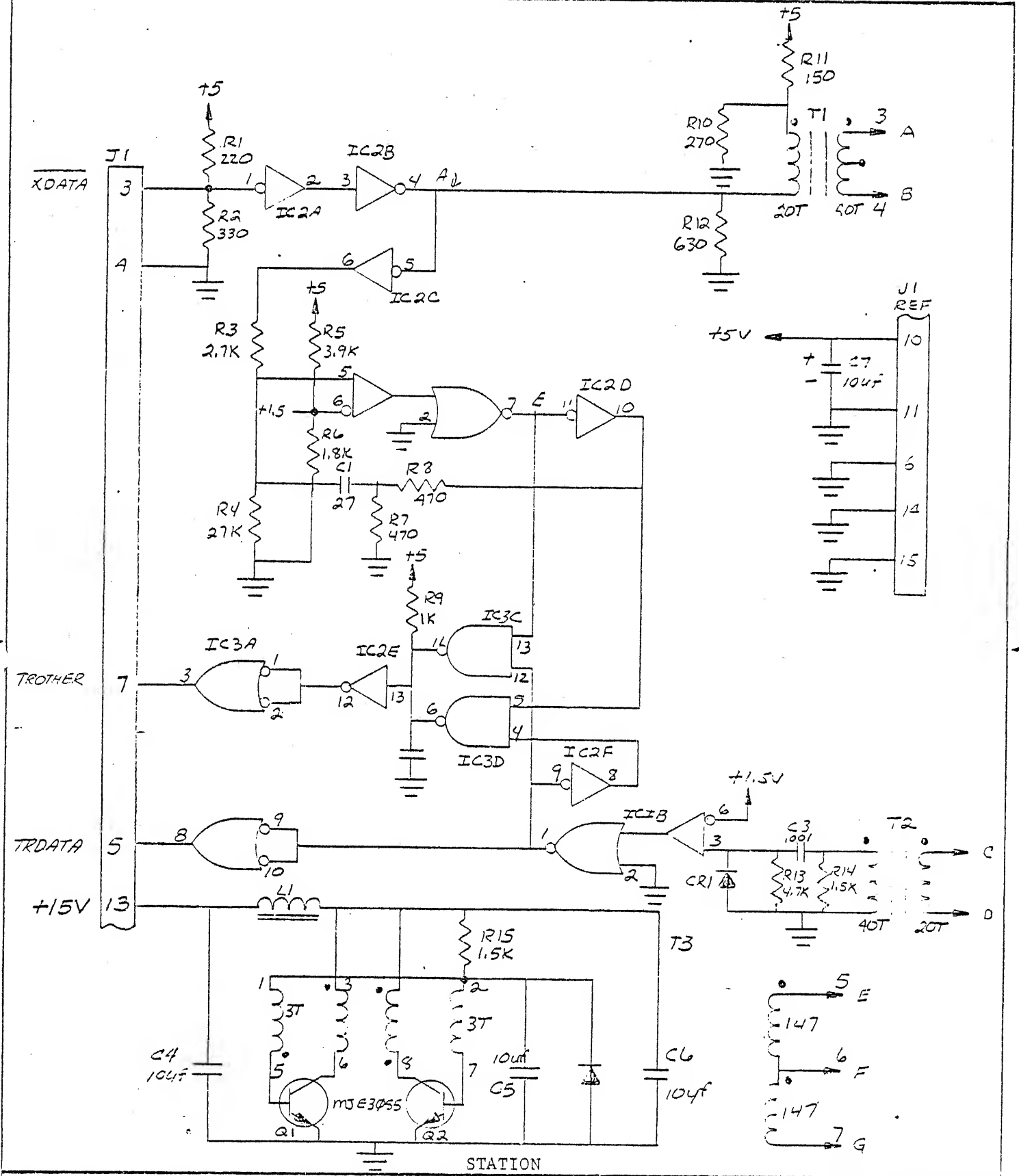

Title ALTO II

SPEC, PRO CUREMENT

ETHERNET TRANSCEIVER

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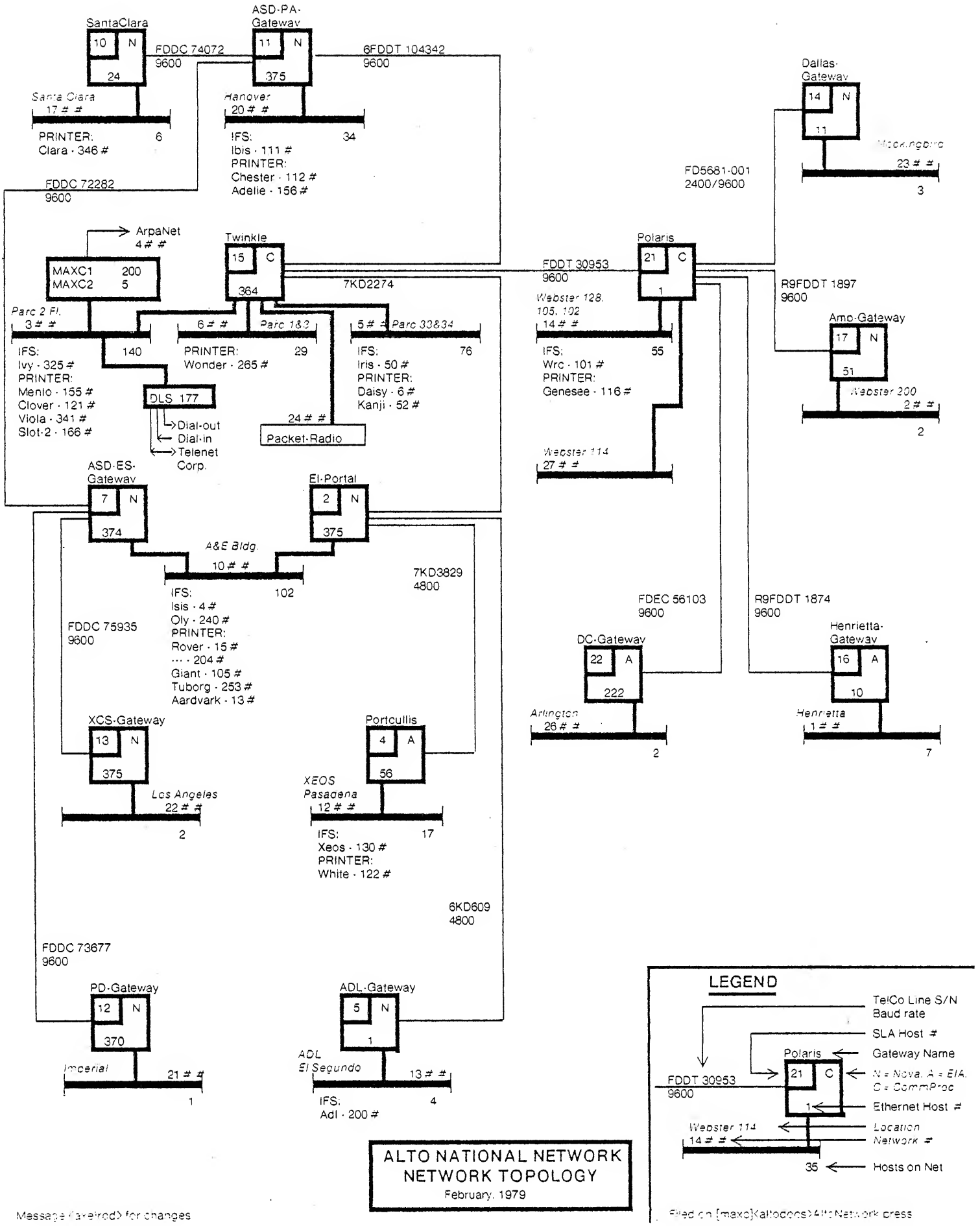
El Segundo, California

XEROX

209926 B

Sheet 4 Of 4

1586(3/73)


SantaClara
10 N
24
FDDC 74072
9600
ASD-PA-Gateway
11 N
375
6FDDT 104342
9600
Santa Clara
17 # #
PRINTER:
Clara · 346 #
6
Hanover
20 # #
IFS:
Ibis · 111 #
PRINTER:
Chester · 112 #
Adelie · 156 #
34
FDDC 72282
9600
Dallas-Gateway
14 N
11
Mockingbird
23 # #
3
FD5681-001
2400/9600
ArpaNet
4 # #
MAXC1 200
MAXC2 5
Twinkle
15 C
364
7KD2274
Polaris
21 C
1
FDDT 30953
9600
Webster 128, 105, 102
14 # #
IFS:
Wrc · 101 #
PRINTER:
Genesee · 116 #
55
R9FDDT 1897
9600
Amo-Gateway
17 N
31
Webster 200
2 # #
2
Parc 2 Fl.
3 # #
140
IFS:
Ivy · 325 #
PRINTER:
Menlo · 155 #
Clover · 121 #
Viola · 341 #
Slot-2 · 166 #
6 # #
Parc 1&3
PRINTER:
Wonder · 265 #
29
5 # #
Parc 3&834
IFS:
Iris · 50 #
PRINTER:
Daisy · 6 #
Kanji · 52 #
76
DLS 177
Dial-out
Dial-in
Telenet
Corp.
24 # #
Packet-Radio
Webster 114
27 # #
ASD-ES-Gateway
7 N
374
EI-Portal
2 N
375
A&E Bldg.
10 # #
102
IFS:
Isis · 4 #
Oly · 240 #
PRINTER:
Rover · 15 #
··· · 204 #
Giant · 105 #
Tuborg · 253 #
Aardvark · 13 #
7KD3829
4800
FDDC 75935
9600
FDEC 56103
9600
DC-Gateway
22 A
222
Arlington
26 # #
2
R9FDDT 1874
9600
Henrietta-Gateway
16 A
10
Henrietta
1 # #
7
XCS-Gateway
13 N
375
Los Angeles
22 # #
2
Portcullis
4 A
56
XEOS
Pasadena
12 # #
IFS:
Xeos · 130 #
PRINTER:
White · 122 #
17
6KD609
4800
FDDC 73677
9600
PD-Gateway
12 N
370
Imperial
21 # #
1
ADL-Gateway
5 N
1
ADL
El Segundo
13 # #
IFS:
Adl · 200 #
4
LEGEND
TelCo Line S/N
Baud rate
SLA Host #
Gateway Name
N = Nova, A = EIA,
C = CommProc
Ethernet Host #
Location
Network #
Hosts on Net
Polaris
21 C
1
FDDT 30953
9600
Webster 114
14 # #
35
ALTO NATIONAL NETWORK
NETWORK TOPOLOGY
February, 1979
Message <levelrod> for changes
Filed on [maxc]<alto>docs>Alto.Network.press

ETHERNET TRANSCEIVER INSTALLATION
Xerox P/N 885230/209926

XEROX

Parts Needed in Addition to Transceiver

Jerrold PTC Tap Block	P/N 1491A
Jerrold Cable Drill	P/N CD-11
Replacement Tip	P/N CT-2

Round head, square neck, 5/16-18 x 1" carriage bolt

RG-11 type Foam Coax

Installation Instructions

Remove the bolt and messenger cable hanger (held together by a splined pressure fit), and insert the carriage bolt in its place. (This step may already be done.)

Clamp the tap block to the cable with the threaded opening pointing in the direction in which the transceiver will be oriented. Attempt to space taps at least 6 feet apart. Clumps of closely spaced taps will reduce the maximum cable length and number of taps permissible.

Screw the drill into the hole until the threads bottom out. Back the drill out and clean out any remaining braid. Bits of braid left in the hole can short out the Ether.

Screw the Ethernet Transceiver into the hole. Be gentle! The stinger is brass and the tap block is steel. The stinger will lose a cross threading contest.

~~~~~~~~~~~~~~ CAUTION ~~~~~~~~~~~~~~~~
Do not tighten the transceiver by twisting on the box. Use a 7/16" wrench on the hex faces of the stinger.
~~~~~~

Before applying power, check the voltages with a dummy transceiver or a voltmeter:

+15v +|- 2% between pins 15(+) and 14(-)
+5v +|- 5% between pins 10(+) and 11(-)

Connect the interface cable to transceiver. If possible strain relief the interface cable by tying it to a nearby object such as a pipe.

When power is applied to the transceiver, you should see a red light through the tranparent window in the side of the box. If the light is out the transceiver has detected an internal failure. Removing power momentarily resets the failure detection circuit. If the light does not come on, the transceiver is defective and should be removed.

db 14 Nov 76

DISK AND CONTROLLER

The disk controller is designed to accommodate one of a variety of DIABLO disk drives, including models 31 and 44. Each drive accommodates one or two disks. Each disk has two heads, one per side. Information is recorded on each disk in a 12-sector format on each of up to 406 (depending on the disk model) radial track positions. Thus, each disk contains up to 9744 recording positions (2 heads X 12 sectors X 406 track positions) Figure 1 tabulates various useful information about the performance of the disk drives.

DEVICE	DIABLO 31	DIABLO 44	
Number of drives/Alto	1 or 2	1	
Number of packs	1 removable	1 removable 1 fixed	
Number of cylinders	203	406	
Tracks/cylinder/pack	2	2	
Sectors per track	12	12	
Words per sector	2 header 8 label 256 data	2 header 8 label 256 data	
Data words/track	3072	3072	
Sectors/pack	4872	9744	
Rotation time	40	25	ms
Seek time (approx.)	15 + 8.6*sqrt(dt)	8 + 3*sqrt(dt)	ms*
min-avg-max	15-70-135	8-30-68	ms
Average access to 1 megabyte	80	32 (using both packs)	ms
Transfer rate:			
peak/avg	1.6/1.22	2.5/1.9	MHz
peak/avg	10.2/13	6.7/8	us/word
per sector	3.3	2.1	ms
for full display	.460	.266	sec
for 64K memory	1.03	.6	sec
whole drive	19.3	44 (both packs)	sec

*The notation dt stands for the number of tracks traveled during the seek.

FIGURE 1

The disk controller records three independent data blocks in each sector. The first is two words long, and is intended to include the address of the sector. This block is called the Header block. The second block is eight words long, and is called the Label block. The third block is 256 words long, and is the Data block. Each block may be independently read, written, or checked, except that writing, once begun, must continue until the end of the sector.

When a block is checked, information on the disk is compared word for word with a specified block of main memory. During checking, a main memory word containing 0 has special significance. When this word is encountered, the matching word read from the disk is stored in its place and does not take part in the check. This feature permits a combination of reading and checking to occur in the same block. (It also has the drawback of making it impossible to use the disk controller to check for words containing 0 on the disk).

The Alto program communicates with the disk controller via a four-word block of main memory. The first word is interpreted as a pointer to a chain of disk command blocks. If it contains 0, the disk controller will remain idle. Otherwise, the disk controller will commence execution of the command contained in the first disk command block. When a command is completed successfully, the disk controller stores a pointer to the next command in the chain and the cycle repeats. If a command terminates in error, a 0 is immediately stored and the disk controller idles. At the beginning of each sector, status information, including the number of the current sector, is stored. This can be used by the Alto program to sense the readiness of the disk and to schedule disk transfers, for example. When the disk controller begins executing a command, it stores the disk address of that command. This information is later used by the disk controller to decide whether seek operations or disk switches are necessary. It can be used by the Alto program for scheduling disk arm motion. If the Alto program stores an illegal disk address (like -1) in this word, the disk controller will perform a seek at the beginning of the next disk operation. (This is useful, for example, when a disk driver wants to force a restore operation). The disk controller also communicates with the Alto program by interrupts.

A disk command block is a ten-word block of memory which describes a disk transfer operation to the disk controller, and which is also used by the controller to record the status of that operation. The first word is a pointer to the next disk command block in this chain. A 0 means that this is the last disk command block in the chain. When the command is complete, the disk controller stores its status in the second word. The third word contains the command itself, telling the disk controller what to do. The fourth word contains a pointer to the block of memory from/to which the header block will be transferred. The fifth word contains a similar pointer for the label block. The sixth word contains a similar pointer for the data block.

The seventh and eighth words of the disk command block control the initiation of interrupts when the command block is finished.

The ninth word is unused by the disk controller, and may be used by the Alto program to facilitate chained disk operations. The tenth word contains the disk address at which the current operation is to take place.

DCB:	Pointer to next command block.
DCB+1:	Status.
DCB+2:	Command.
DCB+3:	Header block pointer.
DCB+4:	Label block pointer.
DCB+5:	Data pointer.
DCB+6:	Command complete no-error interrupt bit mask.
DCB+7:	Command complete error interrupt bit mask.
DCB+8:	Currently unused.
DCB+9:	Disk address.

A disk address word A contains the following fields:

FIELD	RANGE	SIGNIFICANCE
A[0-3]	0-13B	Sector number.
A[4-12]	0-625B (Model 44) 0-312B (Model 31)	Cylinder number.
A[13]	0-1	Head number.

FIELD	RANGE	SIGNIFICANCE
A[14]	0-1	Disk number (see also C[15]). 0 is removable pack on Model 44. 1 is optional second Model 31 drive.
A[15]	0-1	0 normally. 1 if cylinder 0 is to be addressed via a hardware "restore" operation.

A disk command word C contains the following fields:

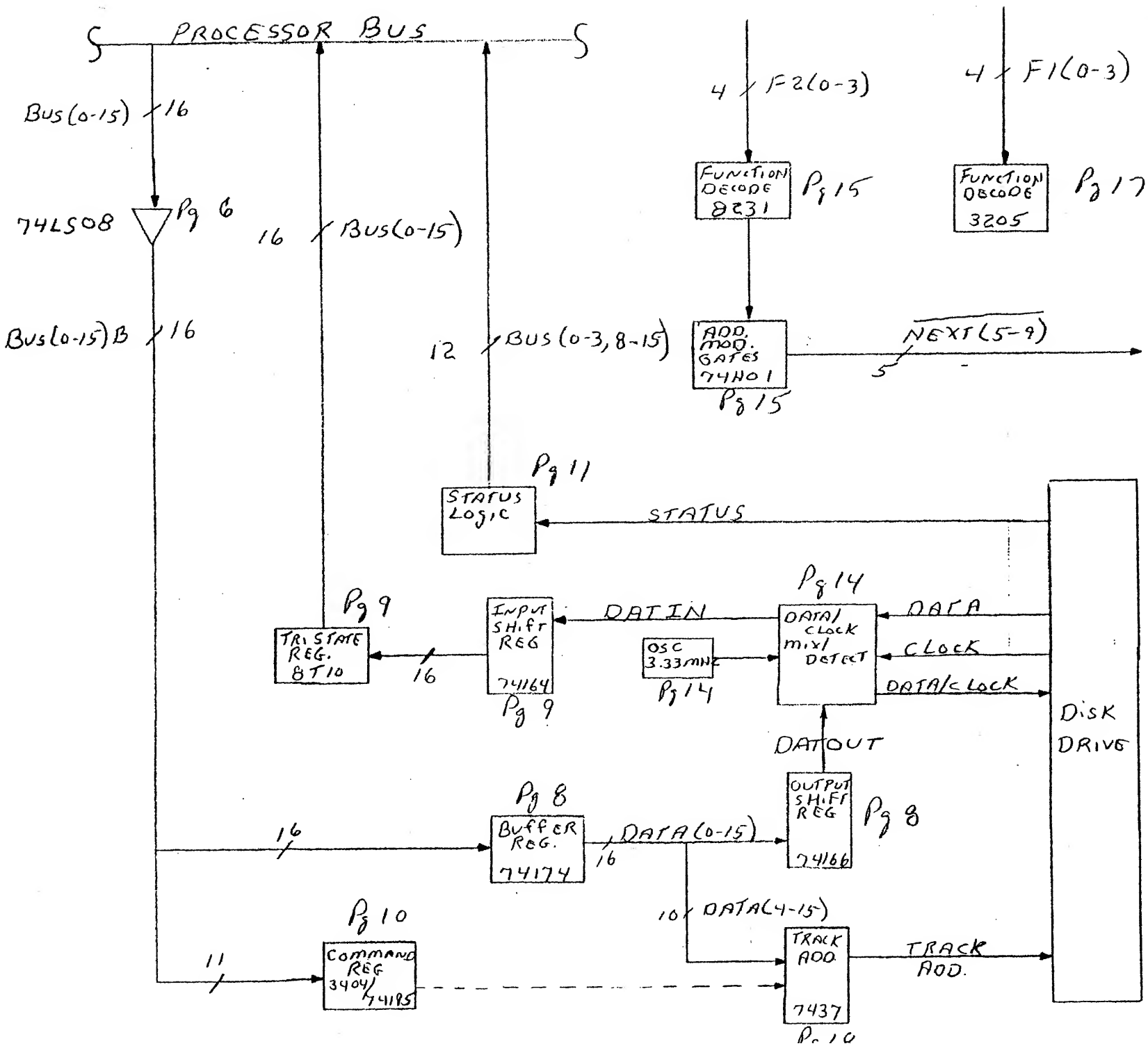
FIELD	RANGE	SIGNIFICANCE
C[0-7]	110B	Checked to verify that this is a valid disk command.
C[8-9]	0-3	0 if Header block to be read. 1 if Header block to be checked. 2 or 3 if Header block to be written.
C[10-11]	0-3	0 if Label block to be read. 1 if Label block to be checked. 2 or 3 if Label block to be written.
C[12-13]	0-3	0 if Data block to be read. 1 if Data block to be checked. 2 or 3 if Data block to be written.
C[14]	0-1	0 normally. 1 if the command is to terminate immediately after the correct cylinder position is reached (before any data is transferred).
C[15]	0-1	XOR'ed with A[14] to yield hardware disk number.

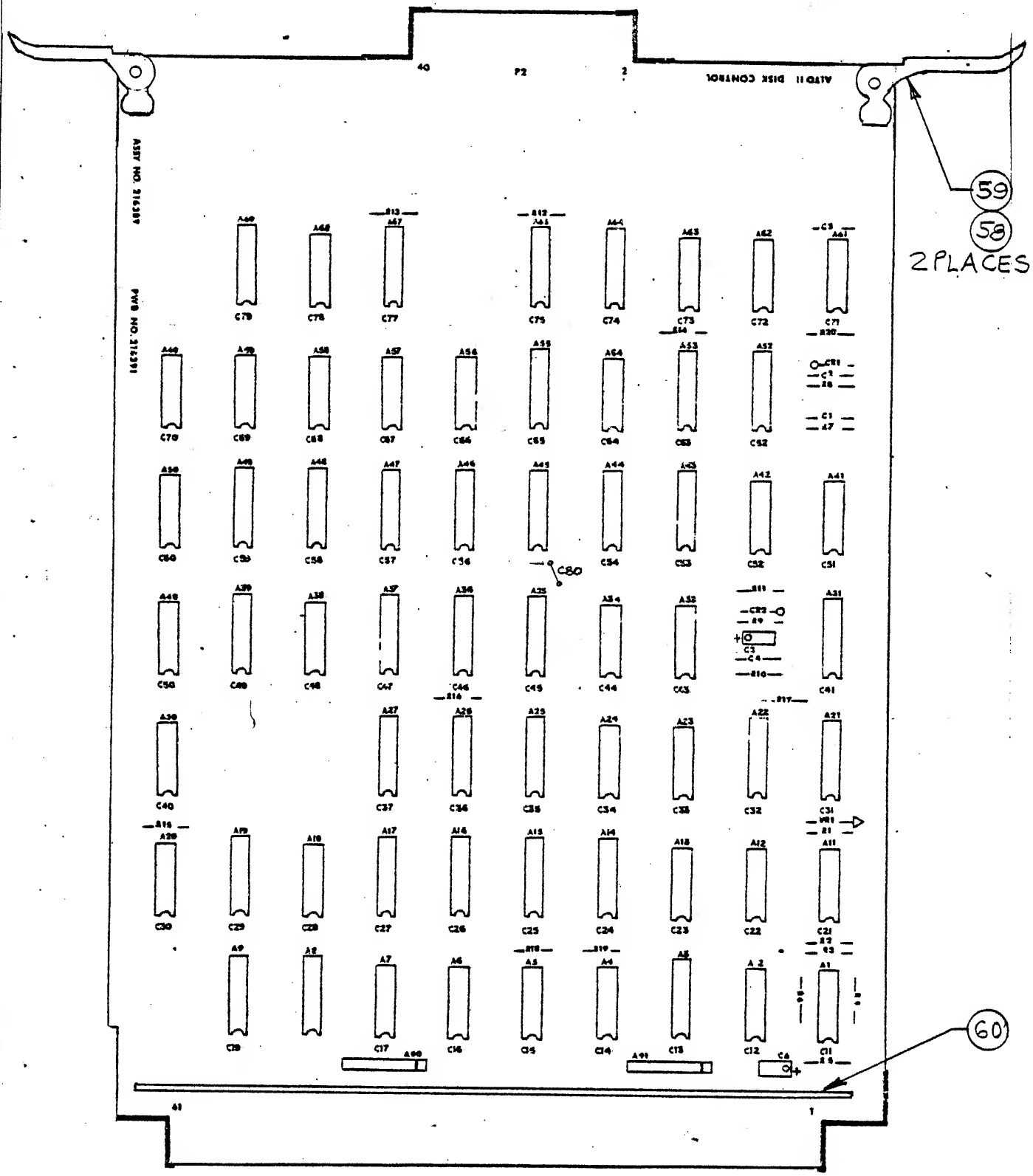
A disk status word S has the following fields:

FIELD	VALUES	SIGNIFICANCE
S[0-3]	0-13B	Current sector number.
S[4-7]	17B	One can tell whether status has been stored by setting this field initially to 0 and then checking for non-zero.
S[8]	0-1	1 means seek failed, possibly due to illegal cylinder address.
S[9]	0-1	1 means seek in progress.
S[10]	0-1	1 means disk unit not ready.

FIELD	VALUES	SIGNIFICANCE
S[11]	0-1	1 means data for sector processing was late during the last sector. Data and current sector number unreliable.
S[12]	0-1	1 means disk interface was not transferring data last sector.
S[13]	0-1	1 means checksum error. Command allowed to proceed.
S[14-15]	0-3	0 means command completed correctly. 1 means hardware error (see S[8-11]) or sector overflow. 2 means check error. Command terminated instantly. 3 means disk command specified illegal sector.

DISK CONTROL MODULE





Title

ASSY, P.W.-
DISK CONTROL

Xerox Corporation
El Segundo, California

XEROX

216389 J

Sheet 3 Of

1586(3/73)

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213 679-4511

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Material List

ML | Drawing No. 216389 | Rev. J

Rev. J

Drawing No. 216389

ML

Drawing Title
ALTO II

ASSEMBLY, PRINTED WIRING-
DISK CONTROL

Model No. ALTO II | Date 6/14/76 | Sheet 4 Of

Item No.	Drawing Title	Drawing No.	No. Req.	Remarks
1	BOARD, PRINTED WIRING	216391	1	
2	SPEC, TEST	216390	REF	
3	SPEC, MODULE ASSEMBLY	216207	REF	
4	MICROCIRCUIT, MPQ3303		1	A1
5	74H04		3	A2, 56, 59
6	3205		1	A3
7	74LS08		4	A4, 5, 6, 7
8	74H00		1	A11
9	74S04		1	A12
10	74164		2	A13, 18
11	8T10		6	A14, 15, 16, 17, 46, 47
12	74166		2	A19, 39
13	7437		5	A20, 30, 40, 58, 68
14	74109		8	A21, 22, 43, 44, 45, 53,
				55, 67
15	74S32		2	A23, 57
16	7438		2	A24, 34
17	74174		3	A25, 26, 27
18	74123		2	A31, 52
19	7400		2	A33, 63
20	I3404		1	A35
21	74195		2	A36, 37
22	74H08		2	A38, 42
23	74H11		1	A41
24	8231		2	A48, 49
25	74H01		2	A50, 60
26	74S02		1	A54
27	7414		1	A61
28	74H106		1	A64
29	74153		1	A65
30	MICROCIRCUIT, 74161		1	A69
31	OSCILLATOR, K1100A 3.33 MH		1	A62
32				

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Material List

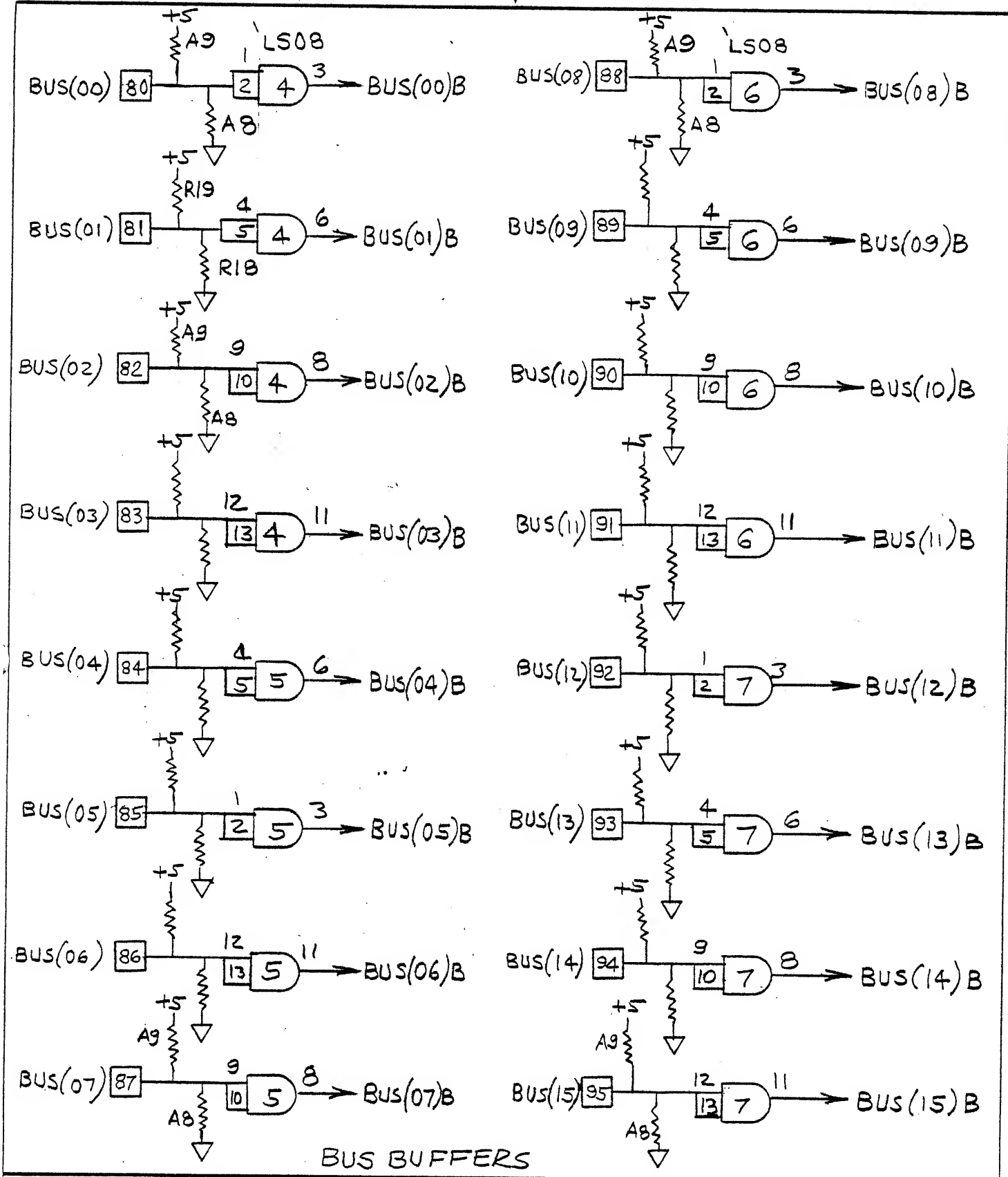
ML	Drawing No. 216389	Rev. J

Rev. J | Drawing No. 216389 | ML

Drawing Title
ALTO II
ASSEMBLY, PRINTED WIRING-
DISK CONTROL

Model No. ALTO II | Date 6/14/76 | Sheet 5 Of

Item No.	Drawing Title	Drawing No.	No. Req.	Remarks
33	RESISTOR, NETWORK, DIP, 270Ω (AB#316A271)		1	A9
34	RESISTOR, NETWORK, DIP, 560Ω(AB#316A561)		1	A8
35	RESISTOR, NETWORK, 470Ω, (CTS #750-81-R470)		2	A90, 91
36	RESISTOR, FILM, 39Ω ±5%, 1/4W	116447-390	2	R1, R2
37	200 Ω ±5%, 1/4W	116447-201	5	R3, 4, 5, 6, 12
38	24K ±5%, 1/4W	116447-243	2	R7, 8
39	15K ±5%, 1/4W	116447-153	1	R9
40	30K ±5%, 1/4W	116447-303	1	R10
41	330 Ω ±5%, 1/4W	116447-331	2	R11, R20
42	560 Ω ±5%, 1/4W	116447-561	1	R18
43	270 Ω ±5%, 1/4W	116447-271	1	R19
44	RESISTOR, FILM, 1K ±5%, 1/4W	116447-102	5	R13, 14, 15, 16, 17
45				
46	DIODE, IN4148		2	CR1, CR2
47	DIODE, ZENER, IN5227		1	VR1
48				
49	CAPACITOR, 150PF NYTRONICS DC151		1	C1
50	CAPACITOR, .01μF		2	C2, C4
51	CAPACITOR, .47μF ±20%, 50V	114491-474	1	C3
52	CAPACITOR, 270PF NYTRONICS DC 271		1	C5
53	CAPACITOR, TANT., 22μF ±20%, 15V	114491-226	1	C6
54	CAPACITOR, .05μF, 10V CENTRALAB#UK10-503		61	C11-17, 19, 21-37, 40, 41,
				43-54, 56-60, 62-75, 77-79
55	CAPACITOR, .022 uF, 16V #DC222		1	C80
56	SOCKET, MICROCIRCUIT		31	AUGAT#514-AG10D
57	SOCKET, MICROCIRCUIT		32	AUGAT#516-AG10D
58	RIVET	156111-005	2	
59	EXTRACTOR	216250	2	
60	STIFFENER	216242	1	



BUS BUFFERS

Title ALTO II
ASSEMBLY, P.W.-
DISK CONTROL

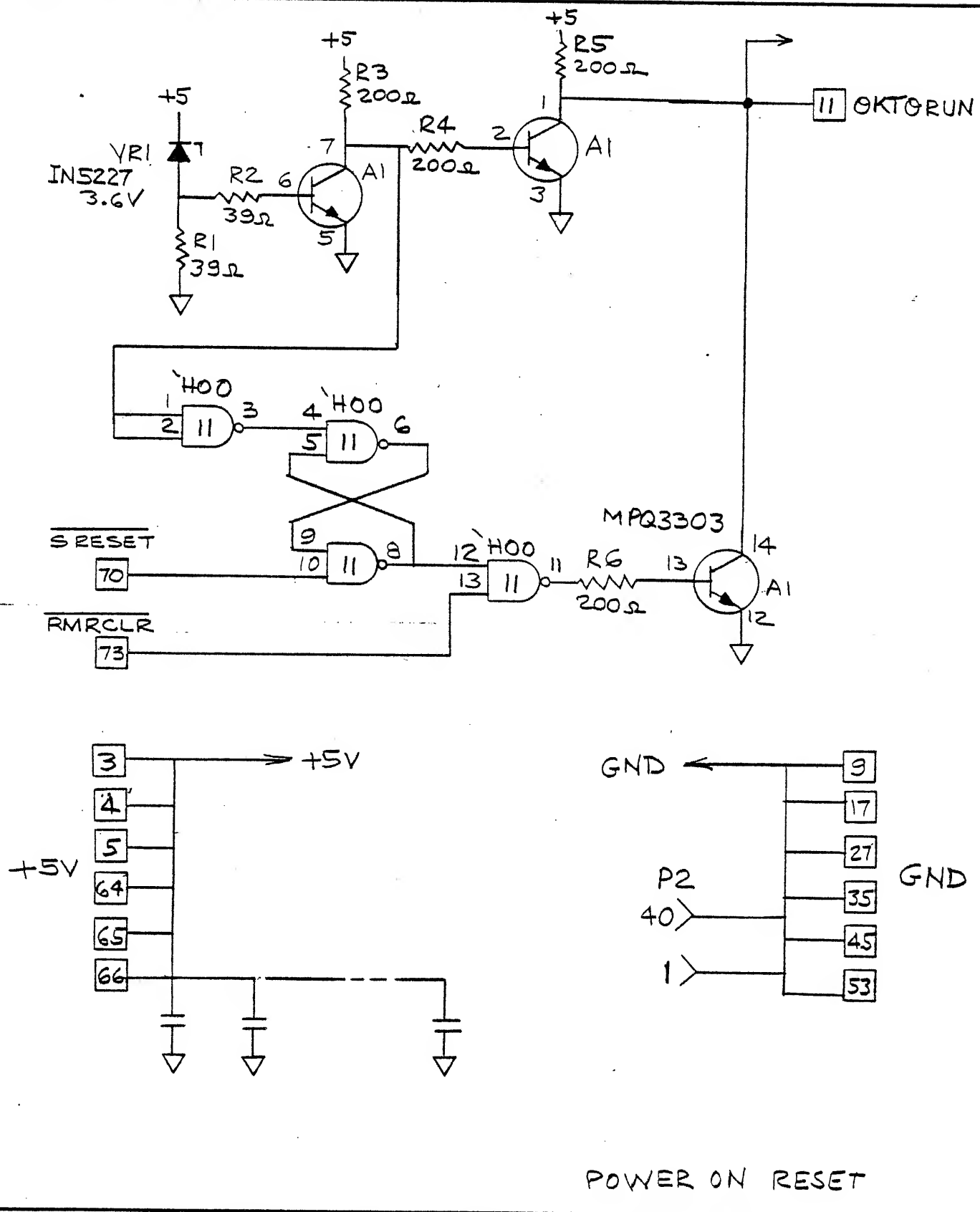
Xerox Corporation
El Segundo, California

XEROX

216389 J

Sheet 6 Of

1586(3/73)



POWER ON RESET

Title
ALTO II
ASSEMBLY, P.W.-
DISK CONTROL

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El Segundo, California

XEROX

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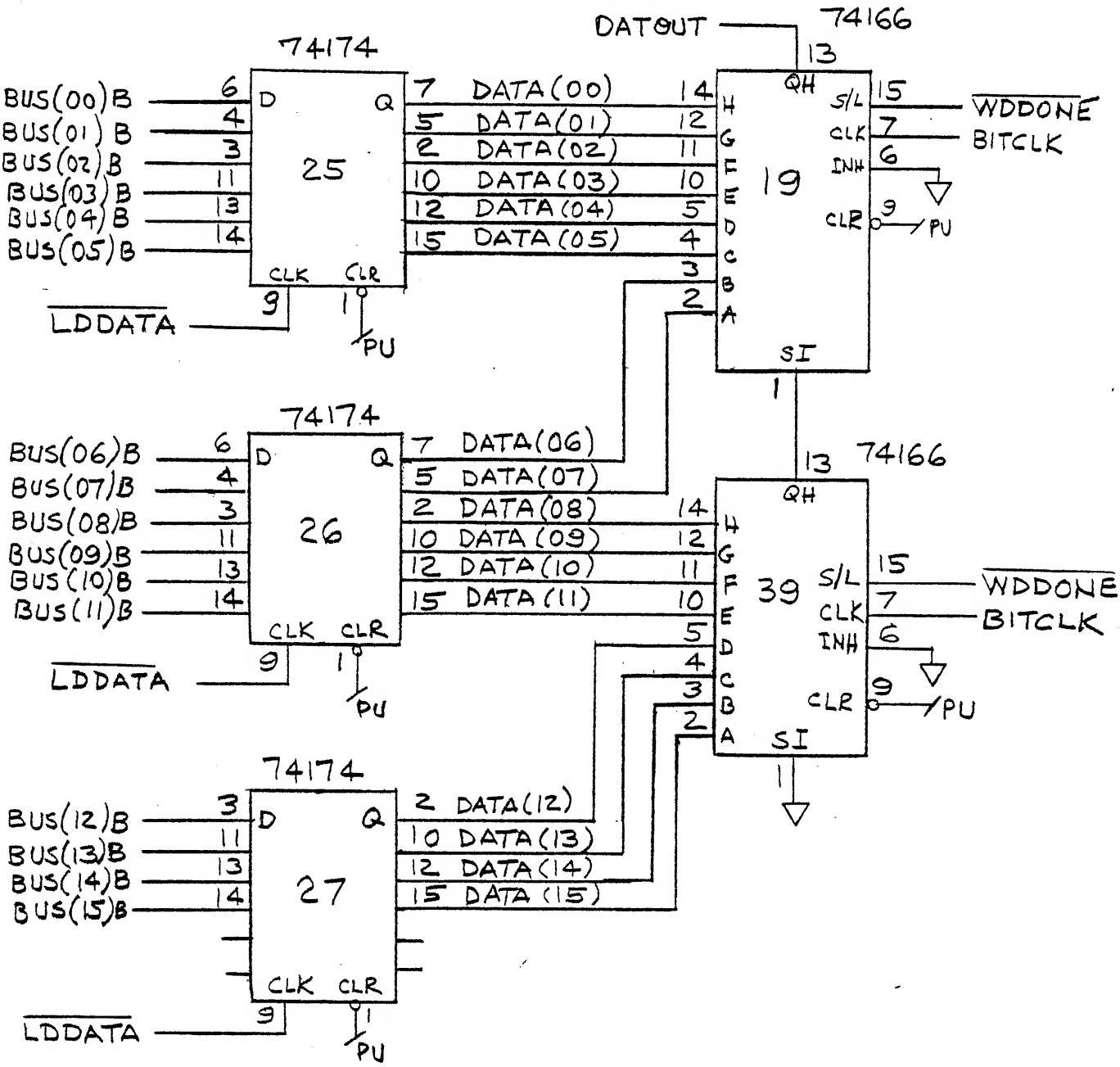


WRITE S/R

Title: ALTO II
ASSEMBLY, P.W.-
DISK CONTROL

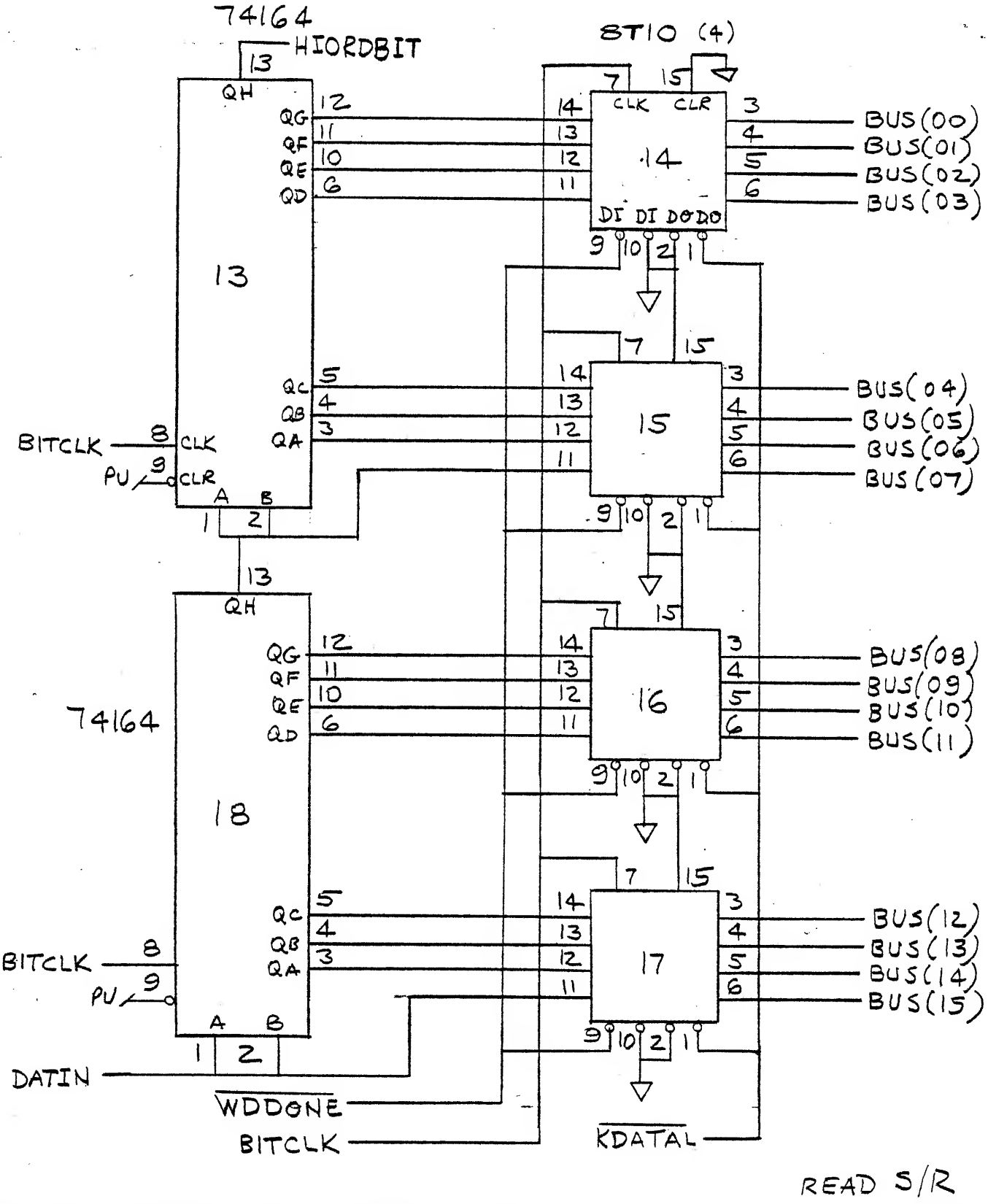
Xerox Corporation
El Segundo, California

XEROX

216389 F

Sheet 8 Of

1586(3/73)



Title
ALTO II
ASSEMBLY, PRINTED W.
DISK CONTROL

Xerox Corporation
El Segundo, California

XEROX

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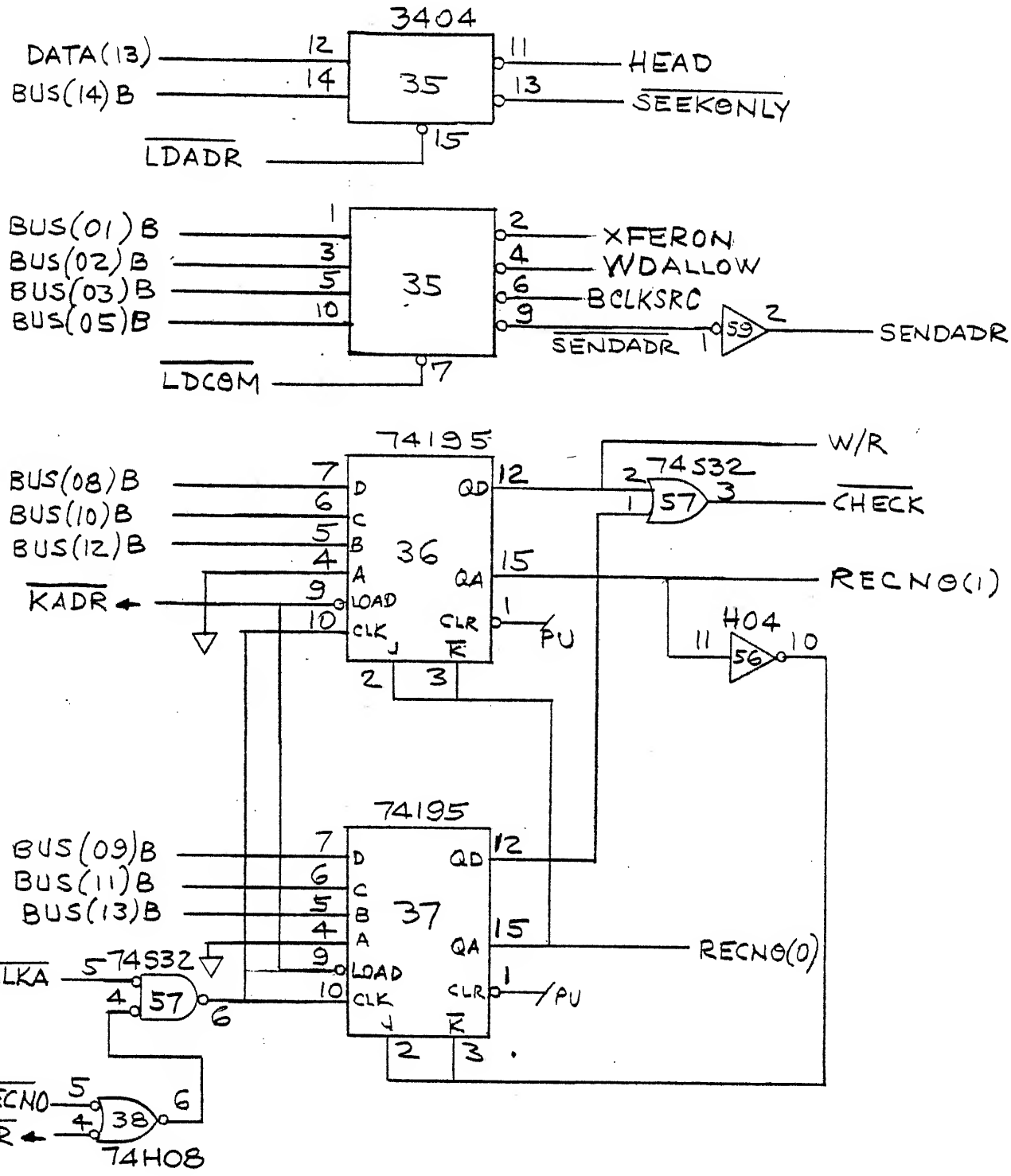

COMP. AND REG.

Title: ALTO II
ASSEMBLY P.W. -
DISK CONTROL

Xerox Corporation
El Segundo, California

XEROX

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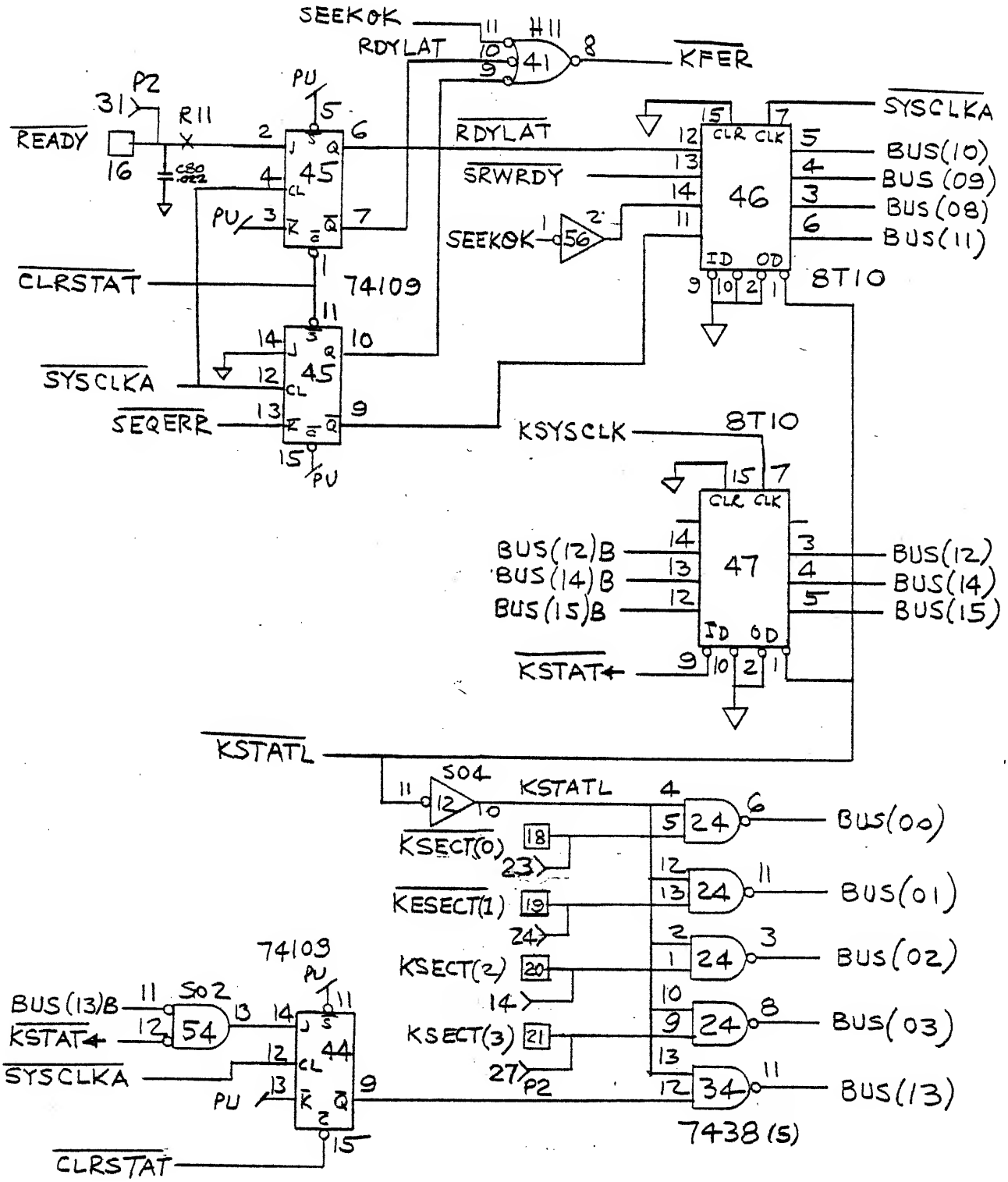

STATUS

Title: ALTO II
ASSEMBLY, P.W. -
DISK CONTROL

Xerox Corporation
El Segundo, California

XEROX

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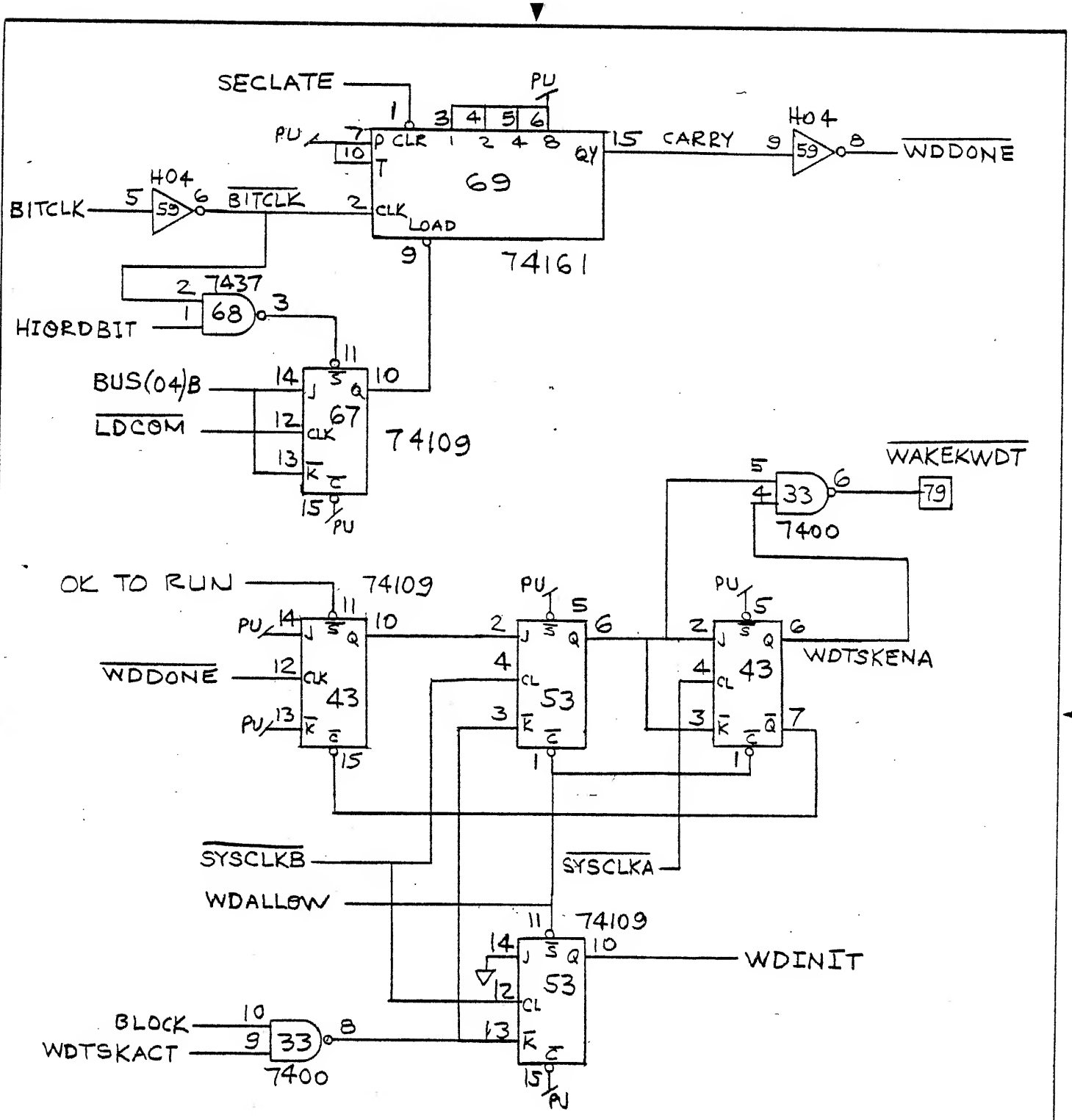

WORD TIMING

Title
ALTO II
ASSEMBLY, PW.-
DISK CONTROL

Xerox Corporation
El Segundo, California

XEROX

216389 J

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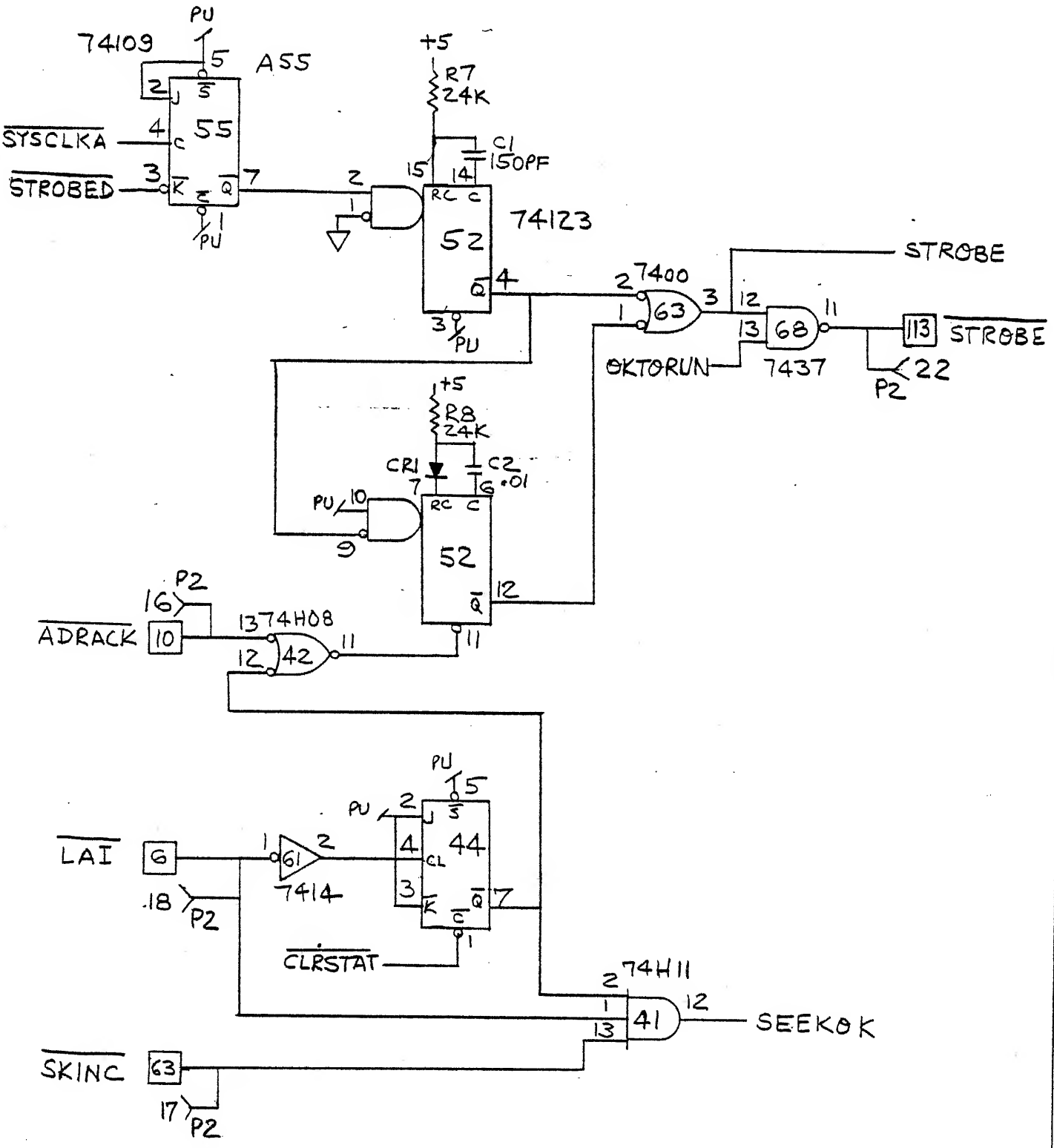
1586(3/73)



STROBE, SEEK ERRORS

Title

ALTO II

ASSEMBLY P.W.- DISK CONTROL

Xerox Corporation
El Segundo, California

XEROX

216389 J

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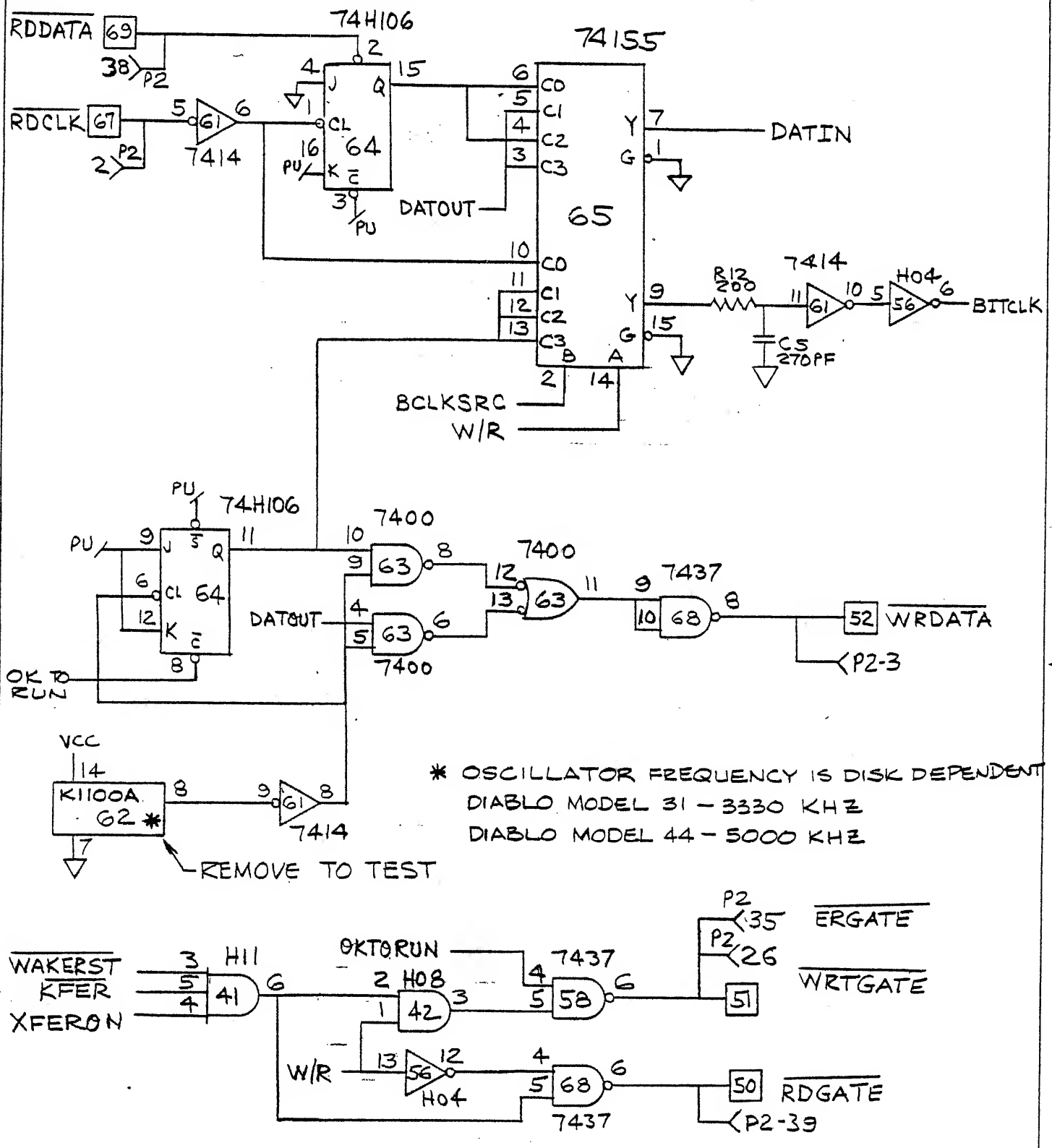
1586(3/73)



Title: ALTO II ASSEMBLY, P.W.- DISK CONTROL

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El Segundo, California

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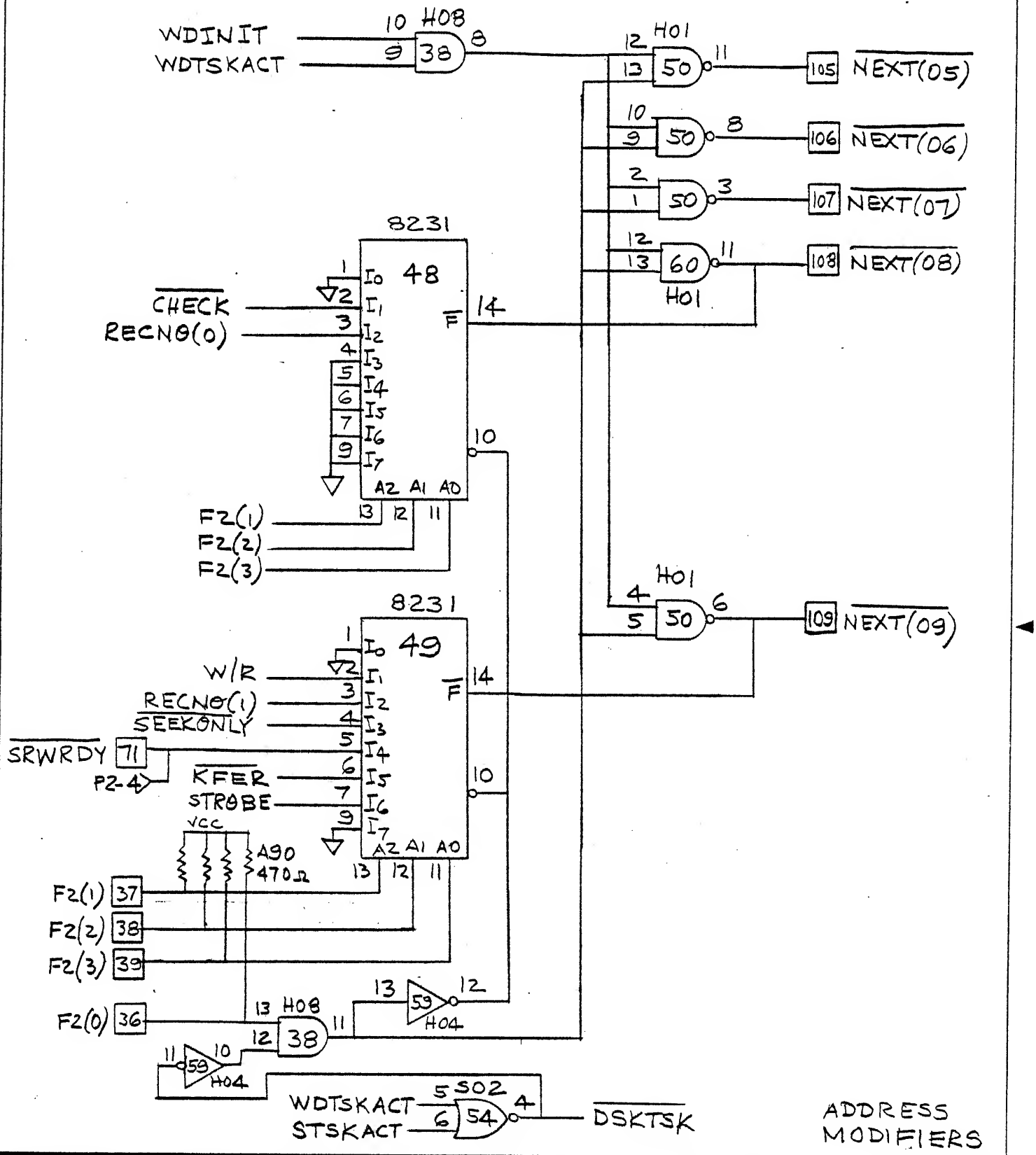

Title
ALTO II
ASSEMBLY P.W.-
DISK CONTROL

Xerox Corporation
El Segundo, California

XEROX

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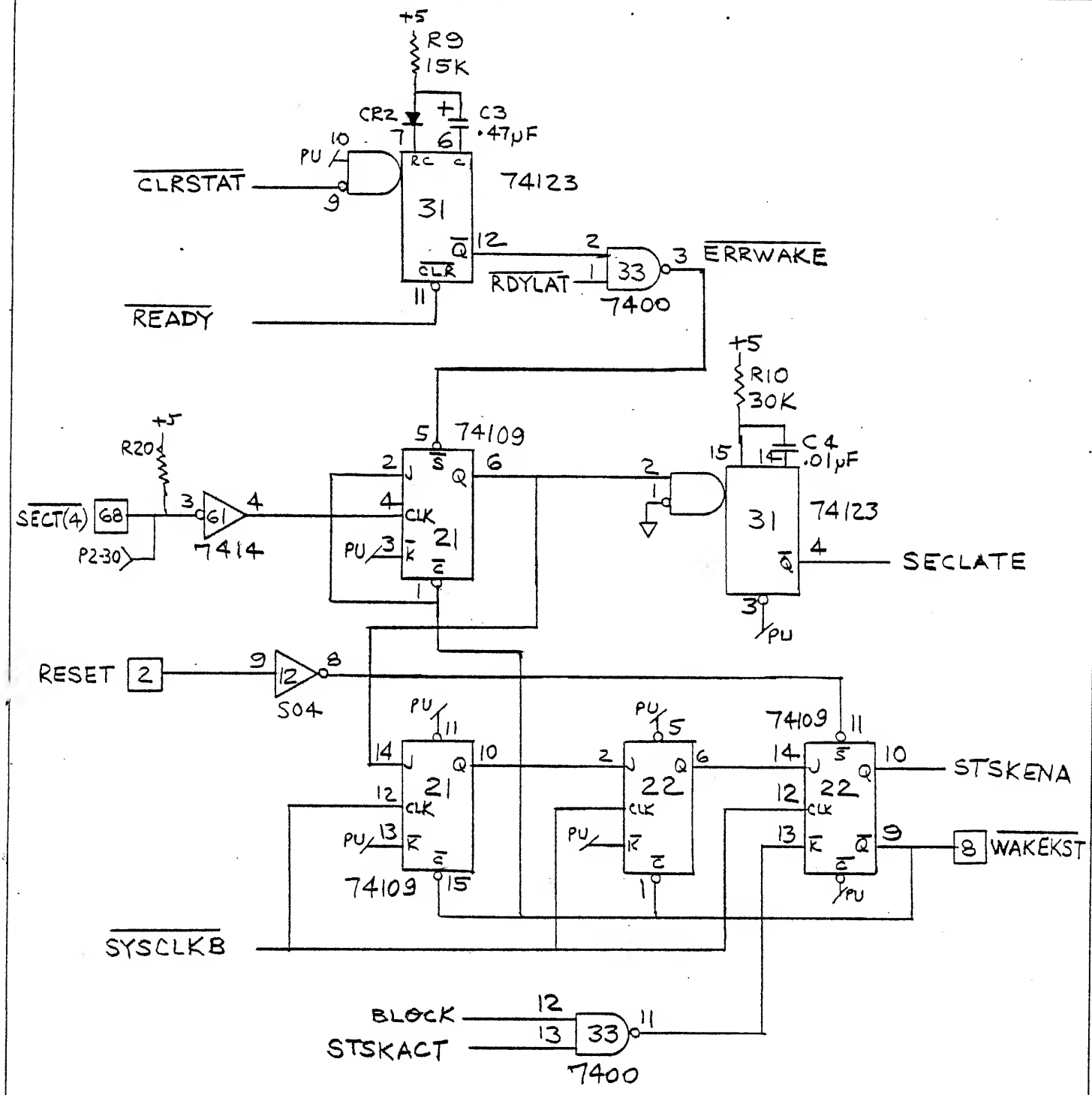

SECTOR, ERROR WAKEUPS

Title

ALTO II

ASSEMBLY, P.W. -

DISK CONTROL

Xerox Corporation
El Segundo, California

XEROX

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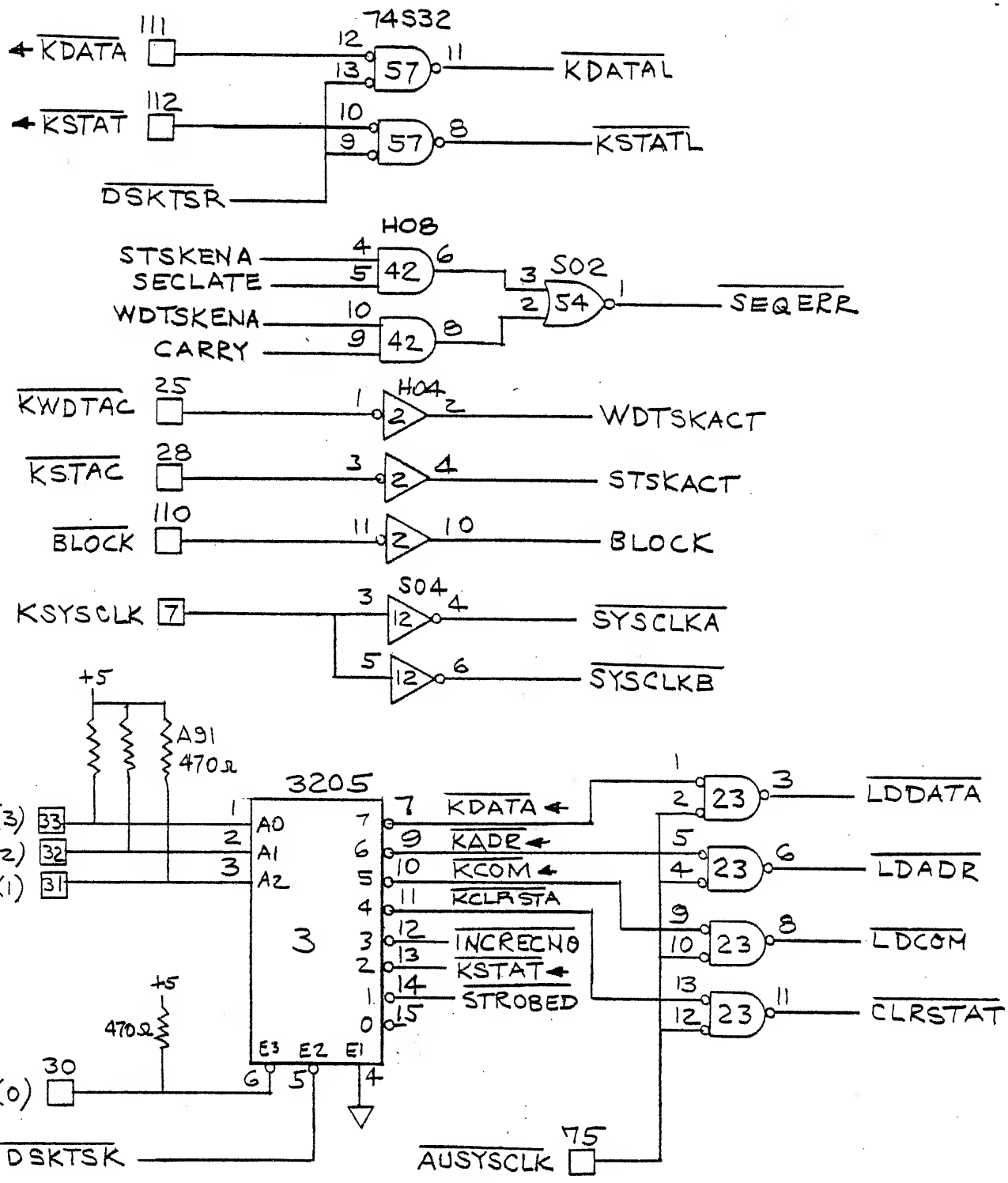

F DECODE, CLOCKS

Title: ALTO II ASSEMBLY, P.W.- DISK CONTROL

Xerox Corporation
El Segundo, California

XEROX

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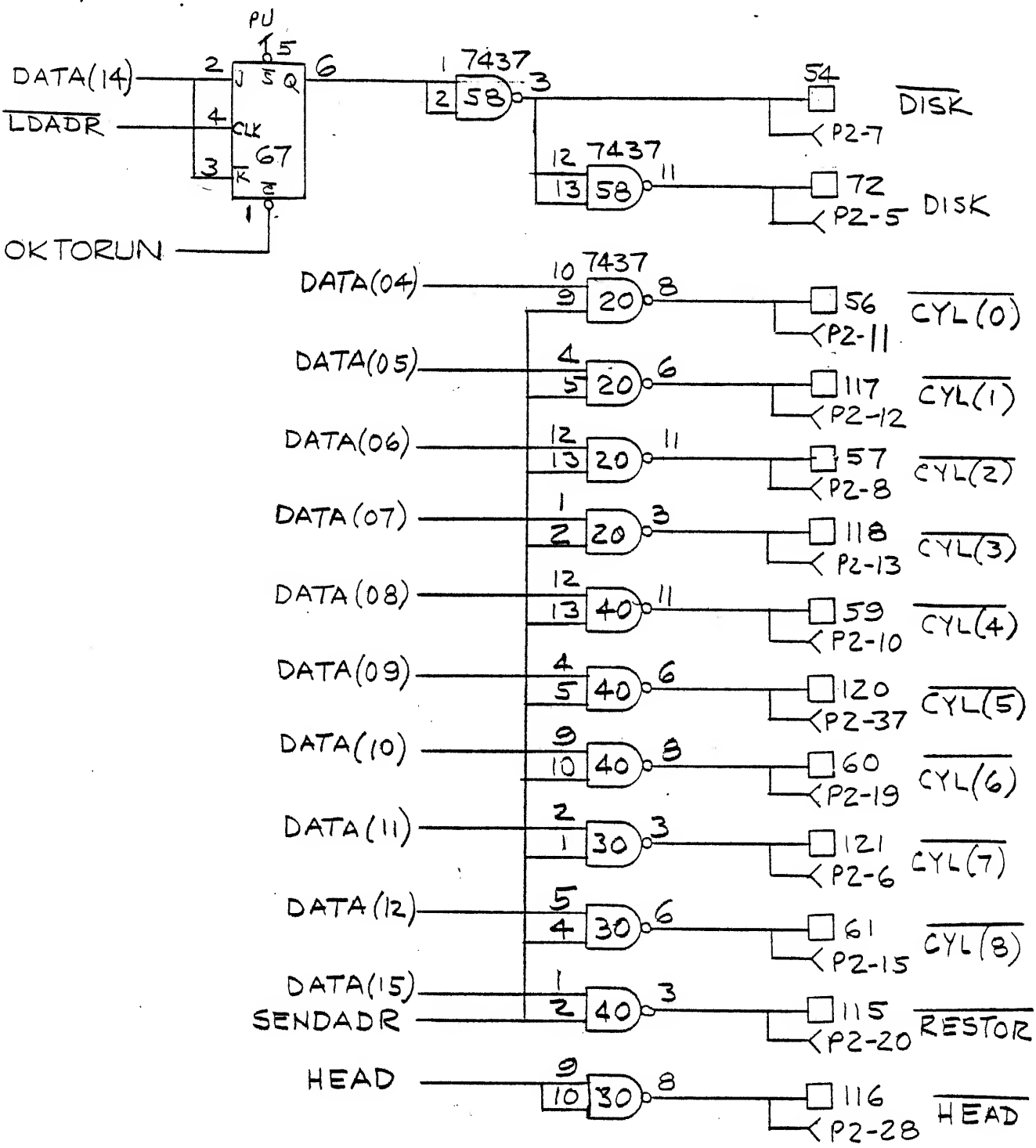
1586(3/73)



DISK ADDRESSING

Title: ALTO II
ASSEMBLY, P.W.- DISK CONTROL

Xerox Corporation
El Segundo, California

XEROX

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1586(3/73)

TRACK "O" ADJUSTMENT
USING SEEK EXERCISER

A) Load pack and bring up to ready state.

B) Scope connections:

X axis on TP1 on J1 board

Y axis on TP2 on J1 board

Time: X - Y

X axis volts .2 for 10 x probe

Y axis volts .5 for 10 x probe

C) Seek exerciser:

Address 1 and 2

All "O"s

Restore - on

Start - on

Step mode - cont. (step position)

Cycle rate C/W

D) Does cont. restore - adjust for pattern to be $135^{\circ} \pm 40^{\circ}$

READ/WRITE HEADS ADJUSTMENT

USING SEEK EXERCISER

A) Load C. E. pack and bring up to ready state.

B) Scope connections:

Ch. #1 - J9 board TP6
Volts .2v
Trigger with Ch. #1 neg. edge

Ch. #2 - J10 board TP2
Volts 20 m.v.

Time: 5 m sec.

C) Seek exerciser:

Address #1 off
Address #2 switches - 64, 32, 8, 1 - on
Restore - on
Start - on
Step mode - step position
Do a seek to track 105

D) Adjust heads for equal valleys.
Single head clamp screws 26 in/ozs. torque.
Dual head clamp screw 50 in/ozs. torque.

TRANSDUCER ADJUSTMENT

USING SEEK EXERCISER

A) Load C. E. pack and bring up to ready state.

B) Scope connections:

Ch. #1 - J9 board TP6
Volts .2v
Trigger with Ch. #1 Neg. Edge

Ch. #2 - J10 board TP2
Volts .2v

Time: 5 μ sec.

C) Seek exerciser:

Address #1 off
Address #2 switches 64, 32, 4 - on
Restore - on
Start - on
Step mode - step position
Do a seek to track #100

D) Adjust for index pulse to be 30 m sec.
Then change head socket for other head - difference between both heads can't be more than 10 m sec.

DIABLO DISC DRIVE
DATA GATE RETROFIT
OF J-10 BOARD

A) Need 2 - 200K pots on clip leads.

B) O'scope

Ch. #1 - TP3 on J10 .2v

Signal ground on Ch. #1

Ch. #2 - TP5 on J10 .2v

Sync on Ch. #1 neg. edge

Time: .05 μ sec.

C) Factory sets gate at 450-470 n sec.

D) Test floor modifies to 440-460 n sec.

E) Cut resistors F28, H53 out of circuit.

F) Put 200K pots in parallel with H56 and H28.

G) Adjust the pot in parallel with H56 for 440 n sec.

H) Adjust the pot in parallel with H28 for 460 n sec.

I) Measure the pots and find resistors that match the resistance of the pots. Then place the fixed resistors in place of F28 & H53. Recheck pulse for approx. time.

MODEL 31 DISC DRIVE SPECIAL TOOLS

Xerox P/N	Description	Diablo P/N
600T1372	Alignment Cartridge	70268
600T1373	Seek Restore Exercisor	11142
600T1374	Extender Board	11040-01
600T1375	Bar Tool	15172
600T1376	Cone Tool	15171
~~600T1377~~	~~Scratch Pack~~	~~3M Corp. #3M-902-24~~
600T1378*	Torque Wrench Handle	70342
600T1379*	Extender Xcelite Mod.	70345-01
600T1380	Test Terminator	11075
600T1381*	Bit Xcelite 99-22	70343
600T383*	Bit Xcelite 990764	

*Note: These tools are part of Torque Wrench Set 600T1396.

DISC DRIVE
DAISY CHAINING UNITS

NORMAL VIEW (BACK)

ONE DRIVE

P/N 11174-03

TWO DRIVES

ORIGINAL DRIVE — P/N 11105-84

NEW DRIVE

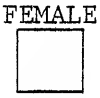
NEED: 11175-03 TERM. & 11105-84 Cable

OR

TWO DRIVES

ORIGINAL DRIVE

NEW DRIVE — P/N 11174-03



NEED: 11245-60 Cable

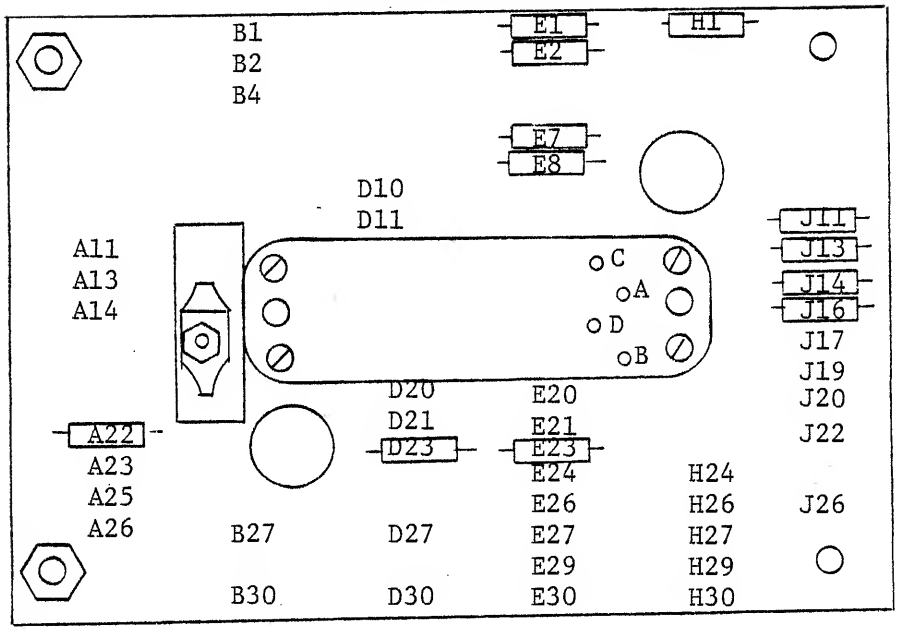
NOTE: XX on cable P/N's is length in inches.

TERMINATOR SERIES 30

P/N 11175-03

FOR ALTO II DISC DRIVE (DIABLO)

FEMALE CONNECTOR



Leave the following resistors on the terminator, clip off the rest:

E1	D23	J11
E2		J13
E7		J14
E8		J16
E23		

Leave on the following caps, clip off the rest:

A22 H1

This leaves the following pins terminated:

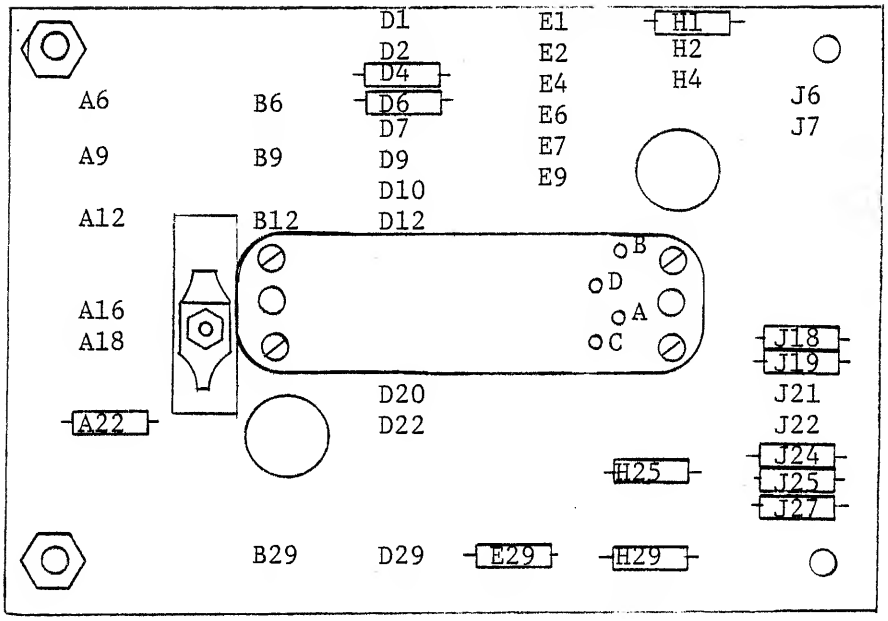
A,C,H,S,V

TERMINATOR SERIES 30

P/N 11174-03

FOR ALTO II DISC DRIVE (DIABLO)

MALE CONNECTOR



Leave the following resistors on the terminator, clip off the rest:

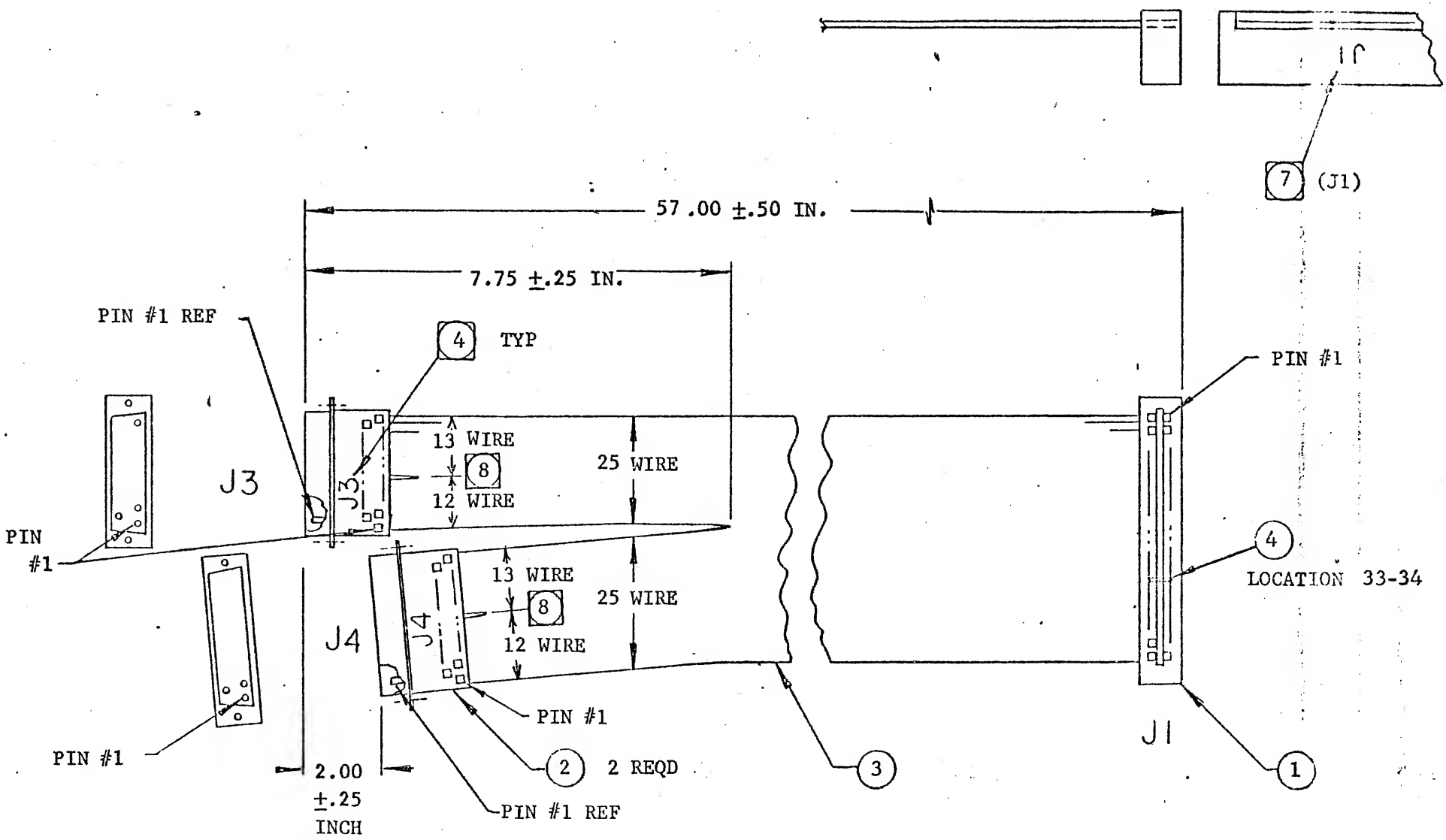
D4	E29	J18	H25
D6		J19	H29
		J24	
		J25	
		J27	

Leave on the following caps, clip off the rest:

A22 H1

This leaves the following pins terminated:

A,C,H,S,V



Title

ALTO II

ASSEMBLY, CABLE - HY-TYPE/XREG

(INTERNAL)

Xerox Corporation
El Segundo, California

XEROX

216416 F

Sheet 3 Of 6

Wire No.	Term	From	To	Term	Wire Type	Notes	Signal	Chg. Let.
1		J3 - 13	J1 - 1		50		$\overline{\text{PPFSTR}}$	
2		25	2				$\overline{\text{PREST}}$	
3		12	3				$\overline{\text{PRIB}}$	
4		24	4				$\overline{\text{PCHSTR}}$	
5		11	5				$\overline{\text{PCARSTR}}$	
6		23	6				$\overline{\text{PDATA1024}}$	
7		10	7				$\overline{\text{PDATA512}}$	
8		22	8				$\overline{\text{PDATA256}}$	
9		9	9				$\overline{\text{PDATA128}}$	
10		21	10				$\overline{\text{PDATA64}}$	
11		8	11				$\overline{\text{PDATA32}}$	
12		20	12				$\overline{\text{PDATA16}}$	
13		7	13				$\overline{\text{PDATA8}}$	
14		19	14				$\overline{\text{PDATA4}}$	
15		6	15				$\overline{\text{PDATA2}}$	
16		18	16				$\overline{\text{PDATA1}}$	
17		5	17				$\overline{\text{PPFRDY}}$	
18		17	18				$\overline{\text{PCHK}}$	
19		4	19				$\overline{\text{PPO}}$	
20		16	20				$\overline{\text{PCHRDY}}$	
21		3	21				$\overline{\text{PRDY}}$	
22		15	22				$\overline{\text{PCARRDY}}$	
23		2	23				GROUND	
24		14	24				GROUND	
25		J3 - 1	J1 - 25				GROUND	
26		J4 - 13	J1 - 26		50		GROUND	

1. Ref Item No's in Applicable Material List.
2. Ref Designations Are Abbreviated. Prefix Each Designation With:

Title

ALTO II

ASSEMBLY, CABLE -
HY TYPE/X REG (INTERNAL)

Xerox Corporation
El Segundo, California

XEROX

216416 F

Sheet 5 Of 6

Wire No.	Term	From	To	Term	Wire Type	Notes	Signal	Chg. Let.
27		J4 - 25	J1 - 27		50		X(0)	
28		12	28				X(8)	
29		24	29				X(1)	
30		11	30				X(9)	
31		23	31				X(2)	
32		10	32				X(10)	
33		22	33				X(3)	
34		9	34				X(11)	
35		21	35				X(4)	
36		8	36				X(12)	
37		20	37				X(5)	
38		7	38				X(13)	
39		19	39				X(6)	
40		6	40				X(14)	
41		18	41				X(7)	
42		5	42				X(15)	
43		17	43				KEYWAY	
44		4	44				KEYWAY	
45		16	45				GROUND	
46		3	46				GROUND	
47		15	47				$\overline{\text{XREG}}$	
48		2	49				$\overline{\text{SEL1}}$	
49		14	49				X(6)	
50		J4 - 1	J1 - 50		50		$\overline{\text{SEL0}}$	

1. Ref Item No's in Applicable Material List.
2. Ref Designations Are Abbreviated. Prefix Each Designation With:

Title
ALTO II
ASSEMBLY, CABLE-
HY TYPE/X REG (INTERNAL)

Xerox Corporation
El Segundo, California

XEROX

216416 F

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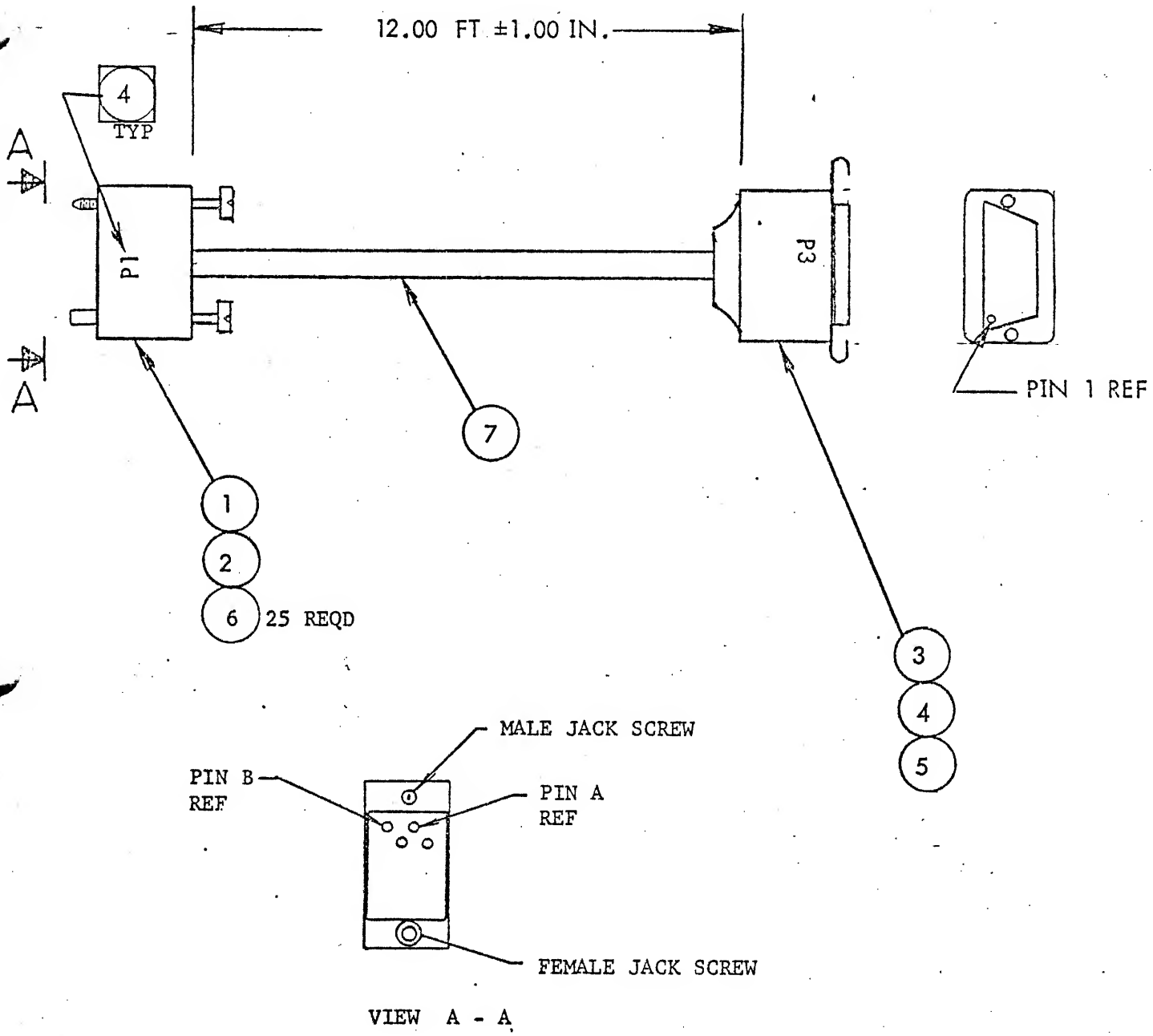

VIEW A - A

Title ALTO II

ASSEMBLY, CABLE

HY TYPE (EXTERNAL)

Xerox Corporation
El Segundo, California

XEROX

216440 C

Sheet 3 Of 6

1586(3/73)

Wire No.	Term	From	To	Term	Wire Type	Notes	Signal	Chg. Let.
1		P1- h	P3- 18		7	BLACK	PDATA1	
2		j	6			WHITE	PDATA2	
3		m	19			RED	PDATA4	
4		f	7			GREEN	PDATA8	
5		k	20			ORANGE	PDATA16	
6		i	8			BLUE	PDATA32	
7		g	21			WHT/BLK	PDATA64	
8		d	9			RED/BLK	PDATA128	
9		b	22			GRN/BLK	PDATA256	
10		V	10			ORN/BLK	PDATA512	
11		F	23			BLU/BLK	PDATA1024	
12		E	25			BLK/WHT	PREST	
13		P	24			RED/WHT	PCHSTR	
14		K	11			GRN/WHT	PCARSTR	
15		C	13			BLU/WHT	PPFSTR	
16		M	12			BLK/RED	PRIB	
17		a	3			WHT/RED	PRDY	
18		B	17			ORN/RED	PCHK	
19		R	4			BLU/RED	PPO	
20		Y	16			RED/GRN	PCHRDY	
21		W	15			ORN/GRN	PCARRDY	
22		c	5			BLK/WHT/GRN	PPFRDY	
23		A	2			WHT/BLK/RED	GROUND	
24		D	14			RED/BLK/WHT	GROUND	
25		P1- J	P3- 1		7	ORN/BLK/WHT	GROUND	
26		P1- S	P1- T		8		SELECT PRINTER	

1. Ref Item No's in Applicable Material List.
2. Ref Designations Are Abbreviated. Prefix Each Designation With:

Title ALTO II
ASSEMBLY, CABLE-
HY TYPE (EXTERNAL)

Xerox Corporation
El Segundo, California

XEROX

216440 C

Sheet 5 Of 6

Wire No.	Term	From	To	Term	Wire Type	Notes	Signal	Chg. Let.
27		P1- H	P1- X		8		SELECT READY	

1. Ref Item No's in Applicable Material List.
2. Ref Designations Are Abbreviated. Prefix Each Designation With:

Title ALTO II

ASSEMBLY, CABLE - HY TYPE

(EXTERNAL)

Xerox Corporation
El Segundo, California

XEROX

216440 C

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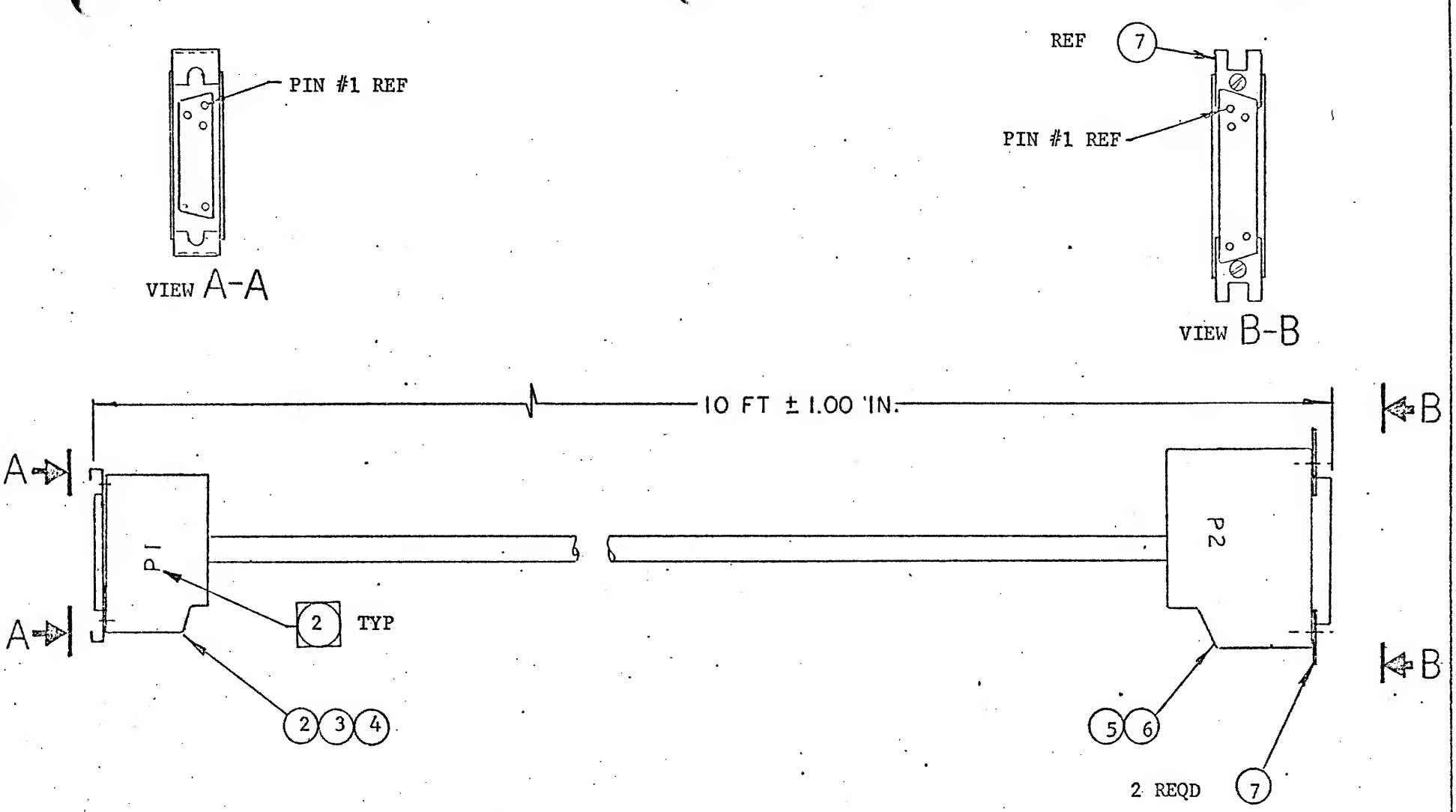

Title

ALTO II

ASSEMBLY, CABLE-

VERSATEC PRINTER/PLOTTER INTERFACE

Xerox Corporation
El Segundo, California

XEROX

216450 B

Sheet 3 Of 5

Wire	Term	From	To	Term	WIRE COLOR	DIABLO MNEMONIC	VERSATEC MNEMONIC	Chg. Let.
1		P1 - 1	P2 - 25	#18	WHT	GND	GND	
2		2	29	#18	BLK	GND	GND	
3		11	12		BLK	PCARSTR'	PRINT	
4		4	19		BRN	PPO'	NOPAP	
5		21	7		RED	PDATA64'	IN07	
6		20	5		ORN	PDATA16'	IN05	
7		19	3		YEL	PDATA4'	IN03	
8		18	1		PUR	PDATA1'	IN01	
9		10	15		GRY	PDATA512'	RESET'	
10		12	18		BLU	PRIB'	RLTER'	
11		13	16		GRN	PPFSTR'	RFFED'	
12		14	20		WHT	GND	GND	
13		16	11		BLU/BLK	FRDY'	READY'	
14		17	32		BLU/BRN	PCHK'	ONLIN'	
15		9	8		ORN/RED	PDATA128'	IN08	
16		8	6		ORN/BLU	PDATA32'	IN06	
17		7	4		ORN/BLK	PDATA8'	IN04	
18		6	2		ORN/GRN	PDATA2'	IN02	
19		22	17		ORN/BRN	PDATA256'	REOTR'	
20		23	14		YEL/RED	PDATA1024'	SPP'	
21		24	10		YEL/BLU	PCHSTR'	PICLK'	
22		P1 - 25	P2 - 9		YEL/BLK	PREST'	CLEAR'	

1. Ref Item No's In Applicable Material List.
2. Ref Designations Are Abbreviated. Prefix Each Designation With:

Title ALTO II

ASSEMBLY, CABLE-

VERSATEC PRINTER/PLOTTER INTERFACE

Xerox Corporation
El Segundo, California

XEROX

216450 B

Sheet 5 Of 5

LAL	Rev.	Revisions: Description	Chk.	Date	Approved
	A	ENGRG RELEASE		3/3/76	G.W.
	B	DWG TITLE WAS "SPEC, PROCUREMENT- ETHERNET HEAD". ADDED SH 3 & 4 SCHEMATIC.	BW	8-6-76	E on BW

209926 B

ENGINEERING RELEASE

3-5-76

Dist. Code ALT

Notes Unless Specified

1. Tolerances
   .XX ±.030 Angular
   .XXX ±.010 ±½°
2. Break All Sharp Edges .010 Approx.
3. Mach. Surfaces ✓
4. All Dim. In Inches

Drawn	[illegible]	2-20-76
Check	G. Lockard	3/3/76
Appr.	G. Lockard	3/3/76
Material		

Xerox Corporation
El Segundo, California

XEROX

ALTO II

SPEC, PROCUREMENT -

ETHERNET TRANSCEIVER

Model No. First Use: ALTO II	Finish	Code Ident. 18338	Size A	Dwg. No. 209926	Change Letter B
Next Assy. First Use: 216362		Scale -	Do Not Scale Drawing	Sheet 1 OF 4	

5641(3-73)

NOTES : UNLESS OTHERWISE SPECIFIED

1. ETHERNET HEAD ASSY MAY BE PURCHASED FROM TAT LAM, 2717 PEACHWOOD COURT, SAN JOSE, CALIFORNIA 95132, VENDOR MODEL NO. 2000 ETHERNET TRANSCIEVER.

Title

SPEC, PROCUREMENT-
ETHERNET TRANSCEIVER

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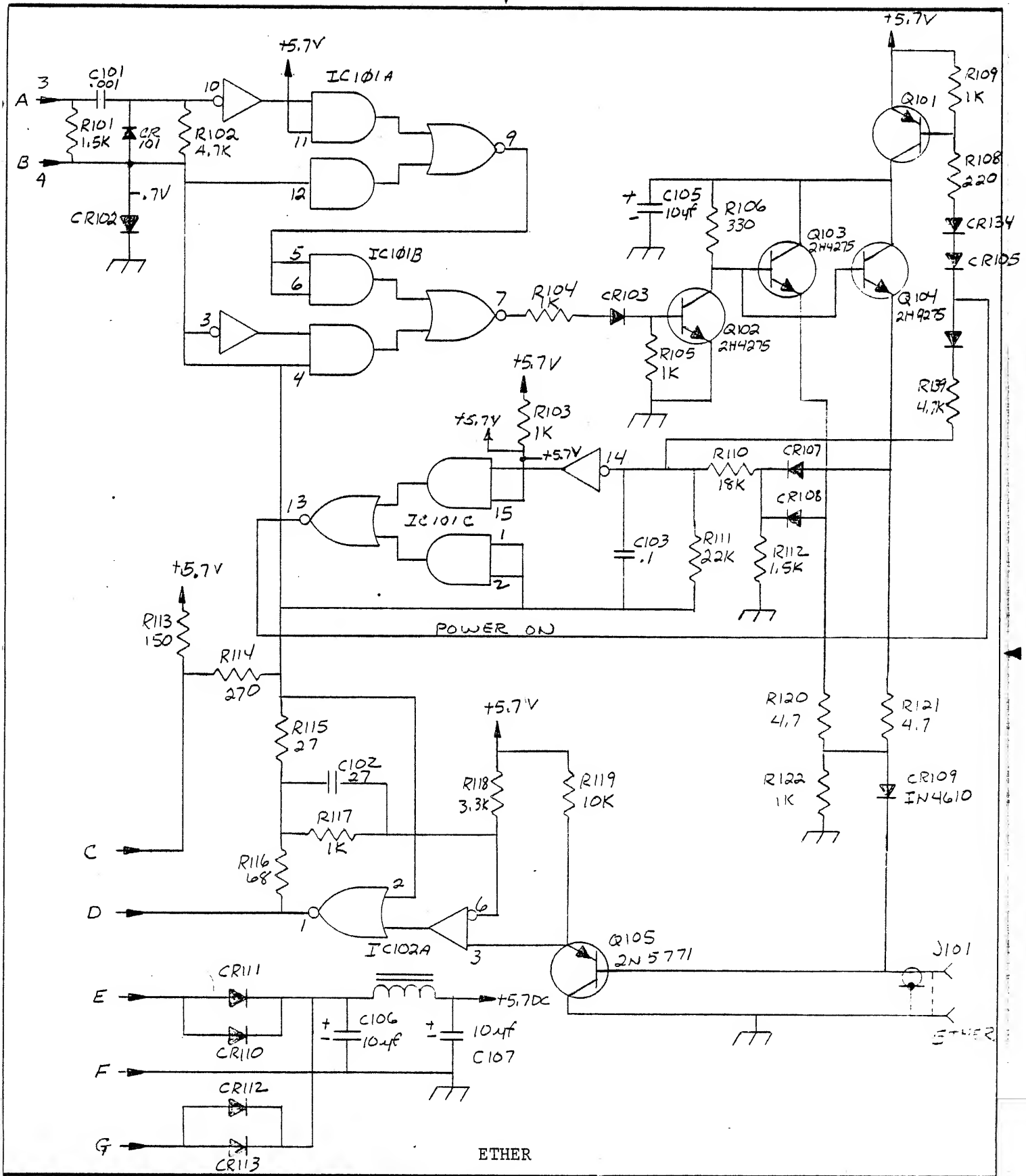
El Segundo, California

XEROX

209926 B

Sheet 2 Of 4



ETHER

Title ALTO II
SPEC, PROCUREMENT-
ETHERNET TRANSCEIVER

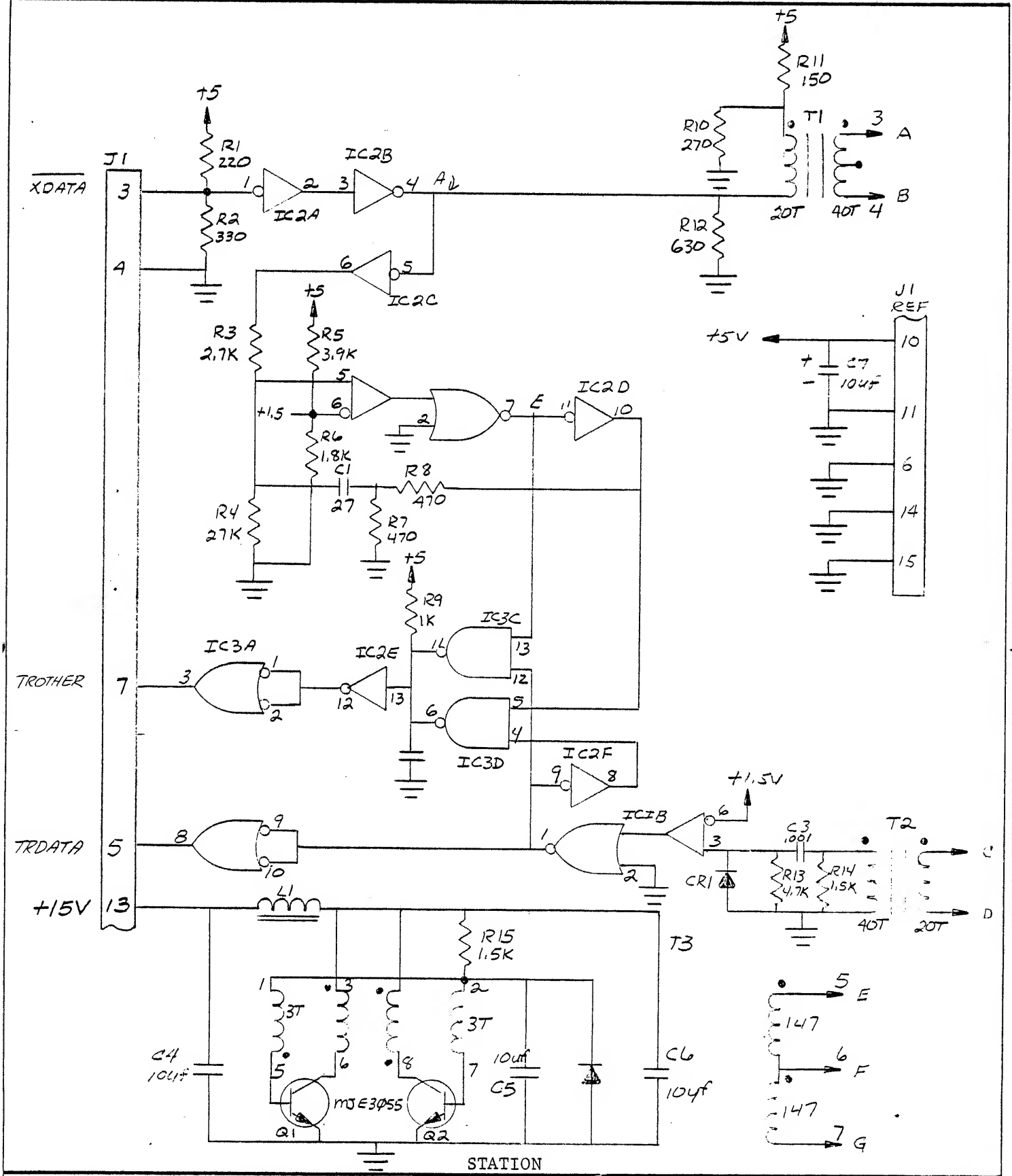
Xerox Corporation
El Segundo, California

XEROX

209926 B

Sheet 3 Of 4

1586(3/73)



Title ALTO II

SPEC, PRO CUREMENT

ETHERNET TRANSCEIVER

Xerox Corporation
El Segundo, California

XEROX

209926 | B

Sheet 4 Of 4

1586(3/73)

LAL	Rev.	Description	Chk.	Date	Approved
	A	ENGRG RELEASE	J.W.	3/15/76	J.W
	B	M/L ITEM 6 WAS QTY 2, M/L ITEM 7 WAS QTY 2, ADDED ITEM 9 & 10.	BN	4-19-76	J.W
	C	DELETED ITEMS 3,5,&8 FROM M/L & F/D	BN	4-13-77	BN

Revisions

216 1 C

ENGINEERING RELEASE

Dist. Code ALT

Notes Unless Specified

1. Tolerances
   .XX ±.030 Angular
   .XXX ±.010 ±½°
2. Break All Sharp Edges .010 Approx.
3. Mach. Surfaces √
4. All Dim. In Inches

Drawn Nishimura 3-15-76

Check J. Ishida

Appr. J. Nishimura 3/15/76

Material

Xerox Corporation
El Segundo, California

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ALTO II

ASSEMBLY, CABLE-
ETHERNET (EXTERNAL)

Model No. ALTO II
First Use EWO 7YF92

Next Assy.
First Use 216362

Finish

Code Ident. 18338

Size A

Dwg. No. 216411

Change Letter C

Scale NONE

Do Not Scale Drawing

Sheet 1 OF 5

NOTES: UNLESS OTHERWISE SPECIFIED

1. FABRICATE PER XEROX SPEC 209154.

(2) MARK CHARACTERS .12 HIGH "NEWS GOTHIC".

(3) MAY BE PURCHASED FROM BELDEN CORP, RICHMOND, INDIANA, VENDOR PART NUMBER.

(4) MAY BE PURCHASED FROM CANNON ELECTRIC, SANTA ANA, CALIF, VENDOR PART NUMBER.

Title
ALTO II
ASSEMBLY, CABLE - ETHERNET (EXTERNAL)

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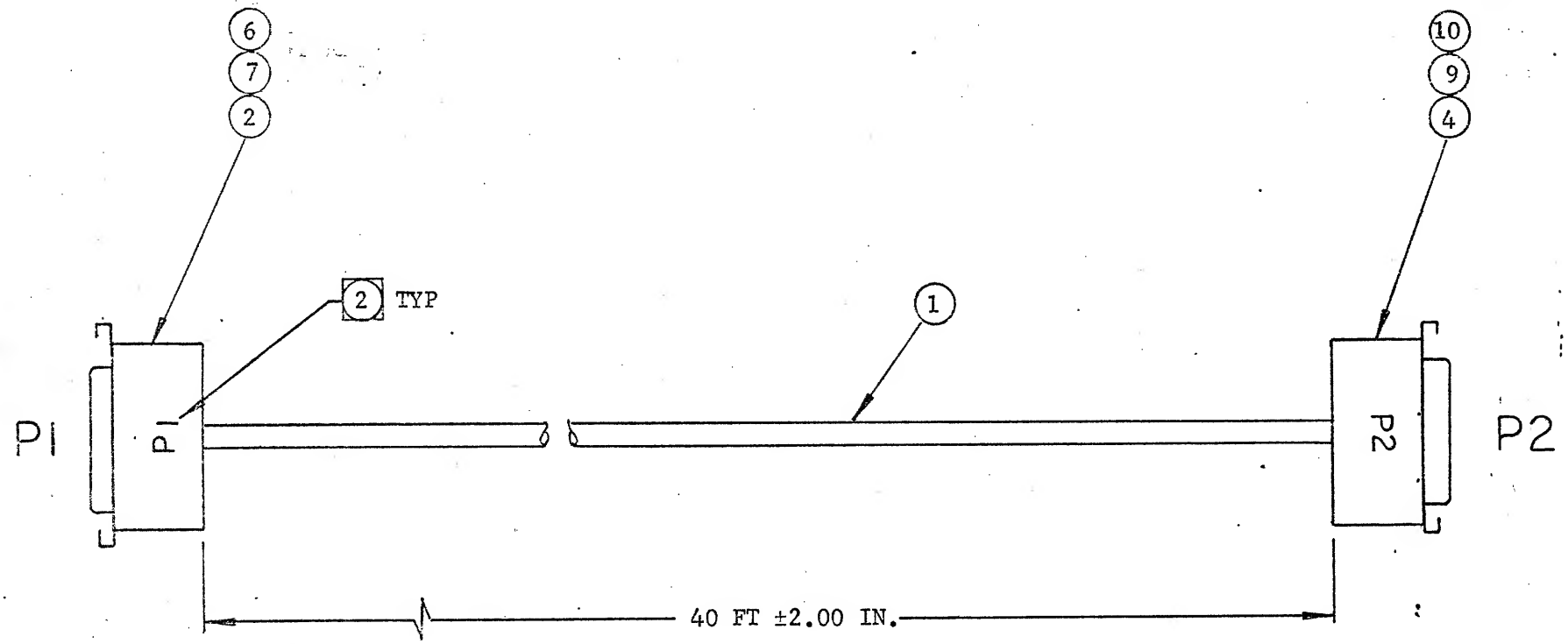
216411 C

Sheet 2 Of 5



Title

ALTO II

ASSEMBLY, CABLE - ETHERNET (EXTERNAL)

Xerox Corporation
El Segundo, California

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216411 C

Sheet 3 Of 5

Xerox Corporation
701 South Aviation Boulevard
El Segundo, California 90245
213 679-4511

XEROX

Material List

ML	Drawing No. 216411	Rev. C

Rev. C | Drawing No. 216411 | ML

Drawing Title: ALTO II
ASSEMBLY, CABLE - ETHERNET
(EXTERNAL)

Model No. EWO 7YF92 | Date 3/12/76 | Sheet 4 Of 5

Item No.	Drawing Title	Drawing No.	No. Req.	Remarks
1	Cable, 6 Pr, 22 AWG		A/R	8747 (3)
2	Shell, Connector		1	(P1) DBC-25P (4)
3	~~Contact, Pin~~		~~12~~	~~030-1952-000~~
4	Shell, Connector		1	(P2) DAC-15S
5	~~Contact, Pin~~		~~12~~	~~030-1953-000~~
6	Retainer, Sliding Lock		1	DB51221-1
7	Shell, Junction (Hood)		1	DB51212-1 (4)
8	~~Strap, Cable Identification~~	~~162244~~	~~2~~	
9	Shell, Junction (Hood)		1	DA51210-1 (4)
10	Retainer, Sliding Lock		1	DA51220-1 (4)

Wire No.	Term	From	To	Term	Wire Type	Notes	Signal	Chg. Let.
1		P1 - 12	P2 - 9		1	BRN } TWISTED PAIR	SPARE	
2		24	1			BLK }	SPARE GND	
3		13	3			GRN }	$\overline{\text{XDATA}}$	
4		25	4			BLK }	GND	
5		16	5			WHT }	TRDATA	
6		3	6			BLK }	TRDATA GND	
7		8	7			BLU }	TROTHER	
8		20	15			BLK }	TROTHER GND	
9		11	10			RED }	+5V	
10		23	11			BLK }	+5V GND	
11		19	13			YEL } TWISTED PAIR	+15V	
12		P1 - 6	P2 - 14		1	BLK }	+15V GND	

1. Ref Item No's in Applicable Material List.
2. Ref Designations Are Abbreviated. Prefix Each Designation With:

Title
ALTO II
ASSEMBLY, CABLE -ETHERNET
(EXTERNAL)

Xerox Corporation
El Segundo, California

XEROX

216411 C

Sheet 5 Of 5